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Forest Fires in Ohio 1923 to 1935

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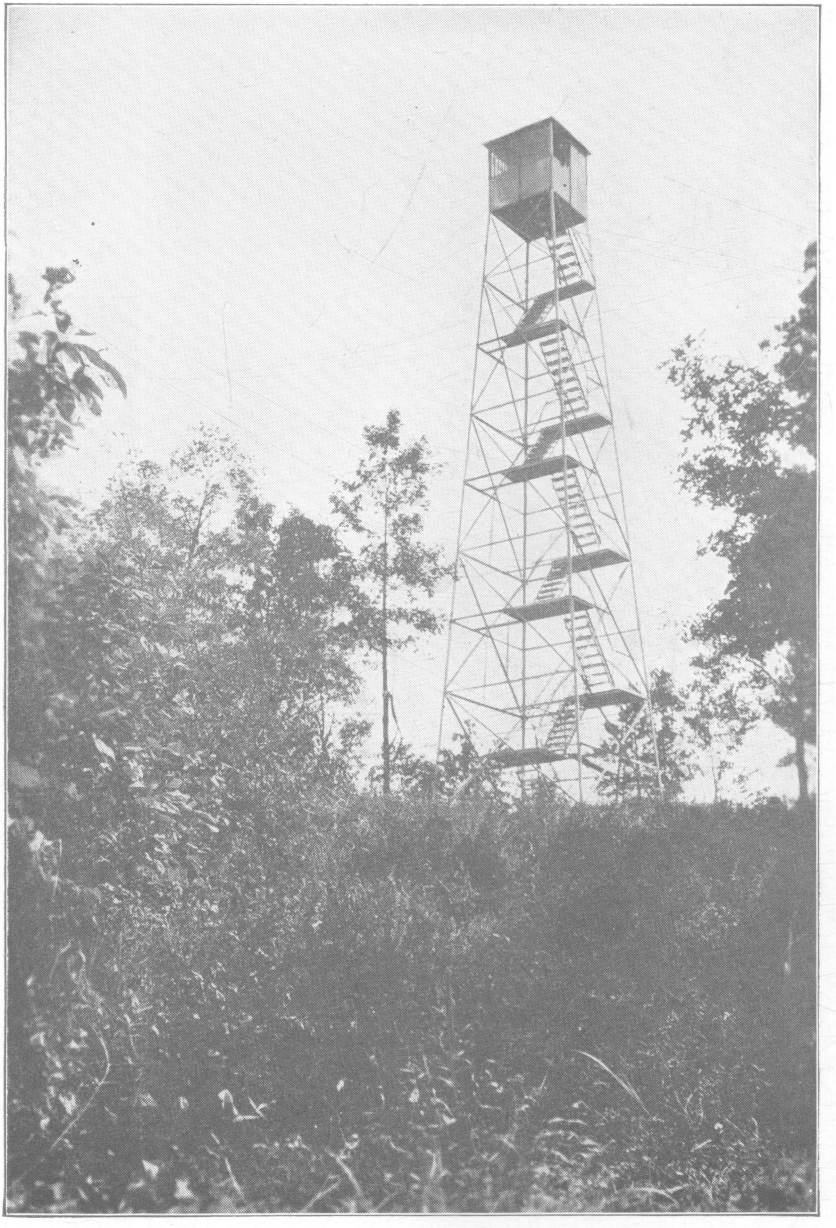

The first forest fire lookout tower in Ohio was built on Copperhead Hill, Shawnee State Forest, in 1924

FOREST FIRES IN OHIO 1923 TO 1935

BERNARD E. LEETE

INTRODUCTION

Fires in the hardwood forests of southern Ohio are similar in a general way as to behavior and effect to those of Pennsylvania, Maryland, West Virginia, Kentucky, and other eastern hardwood states. Ohio fires practically never "crown"; they creep or run along the ground; they are seldom spectacular; they have to date taken no toll in human life; they do not wipe out villages and towns in their path; and they may be controlled, if taken in time, with relative ease. Because of the enormous sprouting capacity of most of the native hardwood species and the luxuriant growth of sprouts, shrubs, and vines following a fire, the damage that has been done by an Ohio fire is frequently obscured from untrained eyes. The fires naturally vary greatly in intensity according to the weather conditions, the quantity and kinds of fuel present, the point of origin with reference to the surrounding topography, and other such factors. The damage runs all the way from none at all to a total killing of the stand.

Perhaps the outstanding feature with reference to Ohio fires is their large number (see Fig. 4). A comparison of the rate of occurrence of forest fires per 100,000 acres of woods in states such as New Jersey, Massachusetts, Connecticut, Maryland, and Ohio, with the corresponding rate of occurrence in states such as Washington, Oregon, Idaho, Minnesota, and Maine will surprise anyone not previously familiar with such data. It will be found that fires are very much more numerous in the former group of states than in the latter when the rate of occurrence is based upon the woods area protected.

State	Average number of fires per 100,000 protected woods acres	State	Average number of fires per 100,000 protected woods acres
New Jersey	62.8	Washington	10.4
Massachusetts	54.2	Oregon	8.4
Connecticut	51.7	Idaho	8.1
Maryland	38.5	Minnesota	7.1
Ohio	35.1	Maine	1.0

The great difference in the rate of occurrence of fires is a result of the difference in woods population. In the first group of states the woods population both resident and transient is very large; in the second group of states it is relatively small.

Ever since the control of forest fires became a function of the State Division of Forestry, written reports, on standardized forms, setting forth in detail the more important facts concerning each individual fire, have been kept on file in the southern Ohio office of the Division. From January 1, 1923, to December 31, 1935, 3,034 of these reports accumulated. In general, the individual fire reports, although at first often unsatisfactory, have steadily improved as to reliability and completeness. It has been the standard practice since 1927 for the division warden to make a personal investigation on the ground of every

fire as soon as possible after its occurrence. The exact position and extent of the burn are then shown on the United States Geological Survey topographic quadrangle which is carried for this purpose. The local or deputy warden's report is then checked for errors and omissions and an investigation is made into the cause of the fire. The report blanks have been revised from time to time as to arrangement and content, but they have always covered the same general facts that fall under the following seven captions: means of discovery; time; location; cause and agency; character and extent of land burned; damage; and cost of suppression. Although there is unquestionably much room for improvement in the promptness and thoroughness of the investigation, a good deal of assurance is felt as to the reliability of most of the data obtained. It is the purpose of this publication to subject this information to careful study and analysis.

A substantial statistical foundation of forest fire facts is essential for the appropriating and directive agencies, for the improvement of the forest fire control organization, and for securing more effective results in all prevention and suppression activities. Many facts about the forest fire situation are recognizable to those closest to the work without the aid of statistical tabulations, but often facts of perhaps equal importance would never be fully appreciated or seen in their true relationships without graphs, maps, and tables of figures.

This statistical study of the Ohio forest fire records will, it is hoped, serve the following purposes:

1. Place the appropriating agencies, both Federal and State, and the public in a position to know what has been accomplished to date in the way of fire suppression;

2. Afford a basis of comparison of fire conditions in this State with similar conditions elsewhere;

3. Assist the Division of Forestry to bring about a proper correlation of prevention and suppression activities, make possible a more ready recognition of zones of peculiar risk, and cast light upon the adequacy and mode of application of educational and regulatory measures;

4. Indicate what additional numerical data should be secured for a more complete understanding of the fire problem.

It is believed that the examination of this publication by the reader will afford him a point of view with respect to forest fire control in Ohio that may be gained in no other way. The exchange of such information between state, federal, and private forest fire control agencies is mutually beneficial. The opportunity to examine the fire data here presented should be of value to the State Legislature, the State Planning Board, other State departments and bureaus, the administrative officers of the United States Forest Service in Ohio, the supervisory personnel of the Civilian Conservation Corps in this State, county, township, and local officials in the areas affected, and many other individuals, groups, and agencies, federal, state, municipal, and private, that are concerned with governmental, educational, economic, and social problems related to the condition and use of Ohio forests.

It is fitting that acknowledgments be made to the other employees of the Ohio Division of Forestry who assisted in securing and assembling the basic information. Especial acknowledgments are also made to Samuel T. Dana who

prepared "Forest Fires in Maine", J. A. Mitchell of the United States Forest Service who wrote "Forest Fires in Minnesota", and H. B. Sayre who collaborated with J. A. Mitchell in the preparation of "Forest Fires in Michigan". These excellent publications have suggested the statistical method, form of tabulation, and arrangement of graphs that have been followed in this report.

AREA, POPULATION, AND TOPOGRAPHICAL FEATURES OF THE FOREST FIRE DISTRICT

With the exception of a few small areas, all the present Forest Fire District lies outside the glaciated portion of the State. The District is approximately 85 miles long from north to south, and its maximum width east and west is about 60 miles. Since 1930 the area protected has remained fixed, and the woodland area within its limits is estimated at 1,039,640 acres. The figures of area were derived in the main from the forest cover maps that were the product of a detailed survey of 10 southern Ohio counties conducted by the Division of Forestry between 1919 and 1923. The small forest areas in Highland and Fairfield Counties were roughly estimated.

Figure 1 shows that four whole counties (Scioto, Pike, Jackson, and Vinton) lie within the limits of the Fire District; that the greater portions of four more

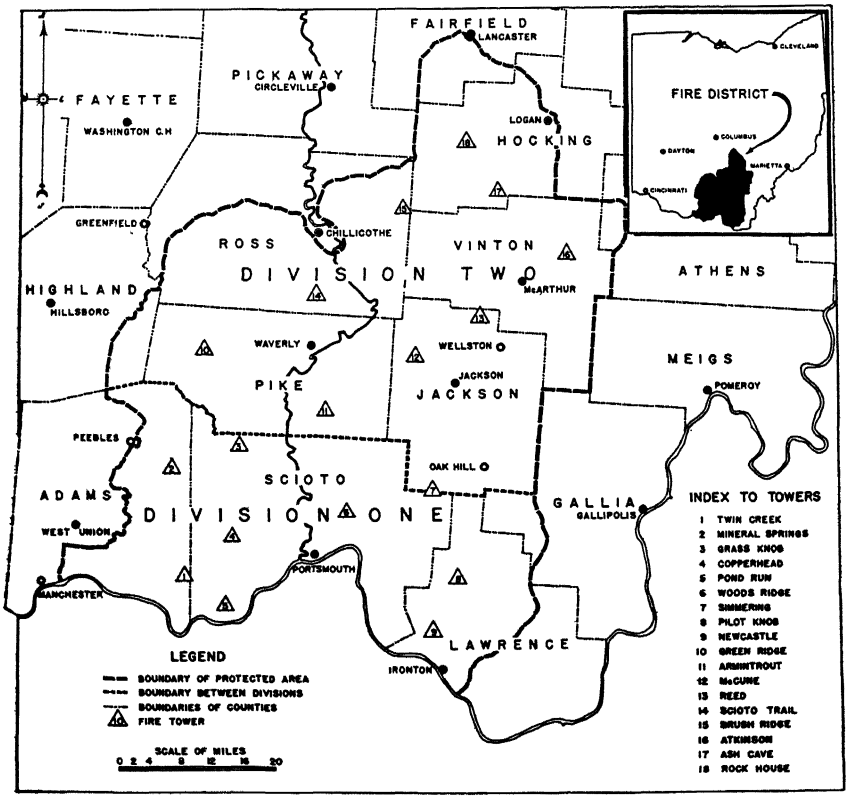

Fig. 1.—The Ohio Forest Fire District

counties (Adams, Lawrence, Ross, and Hocking) are also within the Fire District boundary; and that a very limited part of each of another group of four counties (Gallia, Highland, Athens, and Fairfield) completes the area now protected.

The first three columns of Table 1 were copied from the United States Census of 1930 and apply to the total area of the counties named. The remainder of the table applies only to that part of each county lying within the boundaries of the Fire District. Except in the case of Highland and Fairfield Counties, the figures of area in columns 4 and 6 were determined by the measurement, township by township, and subdistrict by subdistrict, of the forested and other areas mapped in the forest survey mentioned. Since the boundary of the Fire District cuts some townships in two, the rural population of such fractional townships had to be estimated. Column 8 indicates that the ratio of woods area to gross area in most of the counties and fractional counties protected runs very high.

Physiographically, the Ohio Forest Fire District is situated on the western edge of the Allegheny Plateau. This Plateau on the Kentucky side of the Ohio River lies east of the Bluegrass Region. From there its western rim runs northerly and easterly, crossing the Ohio River about 30 miles below Portsmouth at the mouth of the Ohio Brush Creek in Adams County. From this point northward and eastward for a distance of 90 or 100 miles, the edge of the Plateau forms a striking and almost continuous escarpment of wooded hills that is broken only by the larger valleys of such streams as Scioto Brush Creek, Paint Creek, Salt Creek, and the Scioto River. Within the Plateau, now deeply dissected into narrow valleys with wooded slopes, the "general accordance of summit levels" betrays the ancient peneplain surface that was long ago uplifted and, with its sedimentary strata of sandstone, shale, limestone, and coal, tilted toward the southeast. Now and then isolated knobs or monadnocks rise above the general level of the ancient plain sufficiently to afford spectacular views, such as may be had from Grass Knob in Scioto County. Because of the southeasterly dip of the underlying rock strata, the highest hills and greatest differential range in elevations are to be found in the vicinity of the western edge of the Plateau. A maximum elevation of 1,343 feet is reached on Farrell Hill north of Bainbridge, and the minimum elevation above sea level, 480 feet, is found on the Ohio River above Manchester. Toward the eastern side of the Fire District, the hills are frequently broken into flat or rolling agricultural areas. The Fire District there becomes more interrupted, and the areas needing and not needing a fire control organization become more difficult to separate.

Recent investigations indicate that the present total wooded area protected is not quite half of the woods area within the State which ultimately should have a forest fire control system. More or less extended areas needing protection outside the present Fire District are to be found in southern Perry and eastern Hocking Counties, in Athens, Meigs, and Gallia Counties, and in portions of Washington and Monroe Counties. Three other areas apparently in need of protection are: an area between Loudonville and Coshocton lying in Ashland, Knox, Holmes, and Coshocton Counties; an area in eastern, central, and southern Tuscarawas County; and an area, principally on the waters of Yellow Creek, situated in Jefferson and Columbiana Counties west and southwest of Wellsville. It is estimated that all these areas needing protection but unprotected at present would contain a total of about 1,300,000 acres of woods.

TABLE 1.—Area and Population Figures for the Ohio Forest Fire District

By whole and fractional counties within the Ohio Forest Fire District

1930 Census figures				Area and population figures for the Ohio Fire District						
				Gross area*		Woods area*				
County	Area in square miles	Total population 1930	Population per square mile	Acres	Square miles	Acres	Square miles	Per cent woods	Rural population in protected district	Woods acres per capita
Adams	546	20,381	37.3	171,395	267.8	90,770	141.8	53	6,977	13.0
Scioto	623	81,221	130.4	391,845	612.3	251,870	393.5	64	36,096	7.0
Lawrence	443	44,541	100.5	135,715	212.0	85,690	133.9	63	9,615	8.9
Gallia	449	23,050	51.3	21,300	33.3	12,965	20.3	61	603	21.5
Division 1 subtotal	2,061	169,193	82.1	720,255	1,125.4	441,295	689.4	61	53,291	8.3
Highland	549	25,416	46.3	**32,000**	**50.0**	**3,200**	**5.0**	**10**	1,211	2.6
Pike	428	13,876	32.4	281,865	440.4	135,995	212.5	48	13,874	9.8
Jackson	404	25,040	62.0	271,110	423.6	94,750	148.0	35	13,799	6.9
Ross	668	45,181	67.6	293,100	458.0	123,970	193.7	42	19,448	6.4
Vinton	412	10,287	25.0	241,640	377.5	123,490	193.0	51	10,287	12.0
Athens	487	44,175	90.7	24,410	38.1	12,090	18.9	49	1,917	6.3
Hocking	411	20,407	49.7	175,390	274.0	88,850	138.8	51	7,057	12.6
Fairfield	495	44,010	88.9	**64,000**	**100.0**	**16,000**	**25.0**	**25**	3,840	4.2
Division 2 subtotal	3,854	228,392	59.3	1,383,515	2,161.7	598,345	934.9	43	71,433	8.4
Totals for Fire District	5,915	397,585	67.2	2,103,770	3,287.1	1,039,640	1,624.3	49.5	124,724	8.3

*The areas in these columns were derived from the forest survey run by the Division of Forestry in 1919-1923 and were recalculated from the survey maps in 1930 and 1931. Figures in boldface are estimated only, as no surveys have been made to determine the forest areas to date.

In addition to this area, it is estimated that there are within the State about 2,360,000 acres of woods that do not require organized protection. The following tabulation summarizes the situation as it appears at this time.

	Area of woods, acres	Per cent of total area
Needing protection from fire		
Actually protected at present (in round numbers)	1,040,000	22.1
Unprotected at present	1,300,000	27.7
Not in need of protection from fire	2,360,000	50.2
Total estimated forest area	4,700,000	100.0

ORGANIZATION OF THE OHIO FIRE DISTRICT

The total land area within the exterior limits of the Ohio Forest Fire District is approximately 2,103,770 acres, or 3,287 square miles. This is exactly 8 per cent of the total area of Ohio. Its 1,040,000 acres of woods comprise 22.1 per cent of the total estimated woods acreage within the State.

The forest fire control organization in Ohio consists principally of the deputy forest fire wardens. These men are appointed by the State Forester and serve without pay except for actual services rendered. For such work as they are authorized to do the compensation is rather nominal. The deputy forest fire wardens are empowered by law to conscript other residents in emergencies, are given full authority to take control and direction of fire suppression work and to enforce the forest fire laws. The men selected to serve as deputy wardens are for the most part resident farmers, woodland owners, and rural storekeepers. The number of deputy wardens appointed is relatively large, but this large number seems justifiable from several standpoints: First, because of the semivolunteer nature of the work, there is less burden involved for any one warden, and the work is more acceptable where each warden's territory is small. Second, because of the clause in the fire law which requires that the burning of brush and debris during March, April, May, October, and November shall be done only under written permit issued by a forest fire warden, the public is better served if the wardens are not too far apart. Third, because of the rather intricate topography, few wardens can see very far from their residences, and a close spacing of wardens increases the number of fires which will be discovered by the wardens themselves, so that during hazy weather or times of moderate fire danger the towers do not have to be relied upon exclusively for the discovery of fires.

The following tabulation indicates the number of deputy forest fire wardens in each county in the Fire District and the prorata woodland area per warden.

The maintenance of the organization of deputy forest fire wardens is a duty of the district or division fire wardens, of whom there are two. The division wardens encourage the deputy forest fire wardens in the discharge of their duties and foster an *esprit de corps* in the organization. They inspect the burned area after every fire, correcting and supplementing the fire report of the deputy warden. They also take an active part in fire suppression as the need arises. Prosecutions for violation of the fire laws are usually based upon

County	Total woodland area protected	Number of deputy forest fire wardens	Prorata woodland area per warden
Adams	90,770	47	1,931
Scioto	251,870	121	2,082
Lawrence	85,690	41	2,090
Gallia	12,965	3	4,322
Division 1	441,295	212	2,082
Highland	3,200	5	640
Pike	135,995	57	2,386
Jackson	94,750	40	2,369
Ross	123,970	51	2,431
Vinton	123,490	40	3,087
Athens	12,090	3	4,030
Hocking	88,850	31	2,866
Fairfield	16,000	8	2,000
Division 2	598,345	235	2,546
Fire District	1,039,640	447	2,326

the results of their investigations. The division wardens also aid in the selection of the towermen and supervise their work. The towermen are selected as required by law from the deputy wardens in the locality of the tower.

Early in the history of the organization the need for suitable observation points or towers was keenly appreciated. At first it was necessary to resort to patrol in order to discover fires in their incipient stages if possible. This plan was found expensive and not very efficient. The first fire tower, a 60-foot steel structure of standard design, was erected on Copperhead Hill on the Shawnee State Forest in Scioto County in 1924. The following year the Scioto Trail Tower was erected in Ross County. Other towers followed as funds became available for this purpose and seven towers in all had been erected by 1929. Because of the heavy demand for fire suppression in the drouth year, 1930, and the subsequent scarcity of State funds for fire control improvements no more towers were erected until the inception of the Civilian Conservation Corps program in 1933. As approved work projects, 12 more towers were then added, and at present (1936) plans are under way for the construction of two more. One of the 12 towers was erected at the Mohican State Forest in Ashland County, but the others stand within the Fire District of southern Ohio. Since at least two more towers are to be erected within the Fire District, and since telephone communication and other facilities have not in all cases been fully developed, it is clear that the beneficial effects of the tower system have not yet been fully experienced. Marked improvement in fire detection efficiency has already been realized, however. By referring to Figure 1 the approximate location of each tower may be determined. Four of the towers were manned by the United States Forest Service during the fall fire season of 1935. These towers are as follows: the Newcastle Tower (No. 9), the Simmering Tower (No. 7), the McCune Tower (No. 12), and the Reed Tower (No. 13). Owing to the establishment of the Wayne National Forest Purchase Unit in southeastern Ohio, a portion of which lies within the present Fire District, it is anticipated that the United States Forest Service will play an increasing role in fire suppression, especially in that part of the present Fire District lying in Lawrence, eastern Scioto, and eastern Hocking Counties.

Lookout towers are manned only in the presence of real fire danger. The towermen not only watch for smoke but also in some instances act as "smoke-chasers". Under this arrangement the regular towerman sighting the smoke of a fire judged to be out of control calls his substitute to the tower and immedi-

ately leaves for the scene of action. He often has made preliminary arrangements with a so-called registered crew whose members he picks up on the way to the fire. This method, although not receiving universal approval, still possesses some distinct advantages and at its best has resulted in a very marked reduction in area burned.

The towers are located either on State Forests or on donated sites. Secondary improvements usually include a road, a telephone line, a tool house, and a small toilet. On the State Forests the tower site is often developed as a recreational area by the land administration branch of the Division.

The observation room of the tower is equipped with a square cabinet or desk of convenient height and sturdy design. On its top is a board upon which have been glued sections cut from United States Geological Survey quadrangles representing the surrounding country. Ordinarily, the tower is carefully oriented when erected so that the walls of the observation room will coincide with the true cardinal directions. The north edge of the map board when bearing evenly against an orientation strip screwed into the top of the cabinet permits the map to be oriented quickly and accurately. From the point on the map representing the position of the tower has been described a circle graduated in degrees reading from zero at the north point in a clockwise direction to 360. A straightedge held against a pin or brad at the center point of this circle enables the towerman to describe by degree number the direction of any observable smoke. Whenever the same smoke can be observed from one or more other towers, and telephone or other communication is available, its position can immediately be determined with great accuracy. It is this method of graphic triangulation which makes the tower system so indispensable as a method of discovery. Each tower in the system substantially increases the protection on from 75,000 to 150,000 acres of woods, depending upon its particular location. The development of a system of auxiliary observation points has been suggested by the occasional presence of haze and low visibility conditions. This idea is already being tried.

The following tabulation shows for each tower the year it was erected, the approximate elevation of the site above sea level, and the height of the tower from its footings to the floor of the observation room.

Ohio Forest Fire Lookout Towers

Index No. in Fig. 1	Name of tower	Year erected	Elevation of site above sea level, feet	Height of tower from footings to cab floor, feet
1	Twin Creek	1928	1,280	60
2	Mineral Springs	1934	1,180	73
3	Grass Knob	1934	1,320	73
4	Copperhead	1924	1,280	60
5	Pond Run	1934	1,160	80
6	Woods Ridge	1929	1,020	60
7	Simmering Ridge	1933–1934	1,000	59
8	Pilot Knob	1926	1,000	60
9	Newcastle Hill	1933–1934	900	59
10	Green Ridge	1934	1,260	73
11	Armintrout	1934	1,120	80
12	McCune Ridge	1934	980	80
13	Reed Hill	1933–1934	1,000	59
14	Scioto Trail	1925	1,080	60
15	Brush Ridge	1933–1934	1,170	73
16	Atkinson Ridge	1929	1,040	60
17	Ash Cave	1934	1,080	80
18	Rock House	1929	1,160	60
19	Mohican	1934	1,280*	80

*Tower has been moved to new site of 1,360-foot elevation.

TABLE 2.—Total Number of Fires, Relative Size, and Number per 100,000 Acres of Woods

Year	Number	Per cent of decade	Size class					Per cent over 10 acres	Number per 100,000 acres of woods per year	Total woods acres protected April 1
			A	B	C	D	E			
1923	111		4	32	59	11	5	67.6	20.9	532,100
1924	137		7	55	55	16	4	54.7	18.7	732,250
1925	210		2	69	108	24	7	66.4	27.4	764,550
3-year total	458		13	156	222	51	16			
Average	152.7		4.3	52.0	74.0	17.0	5.3	63.1	22.6	676,300
1926	115	3.1	14	53	44	3	1	41.7	14.2	810,890
1927	138	3.7	15	63	56	4		43.7	16.5	838,830
1928	459	12.3	10	188	231	29	1	57.0	44.7	1,025,980
1929	282	7.5	8	112	151	10	1	57.5	27.5	1,025,980
1930	671	17.9	32	270	326	42	1	55.0	64.5	1,039,640
5-year subtotal	1,665	44.5	79	686	808	88	4			
5-year average	333.0		15.8	137.2	161.6	17.6	0.8	54.1	35.1	948,264
1931	328	8.8	10	133	156	28	1	56.5	31.5	1,039,640
1932	456	12.2	8	251	182	15		43.2	43.9	1,039,640
1933	314	8.4	8	156	133	17		47.8	30.3	1,039,640
1934	698	18.7	23	374	278	23		43.1	67.1	1,039,640
1935	278	7.4	13	154	105	5	1	39.9	23.0	1,039,640
5-year subtotal	2,074	55.5	62	1,068	854	88	2			
5-year average	414.8		12.4	213.6	170.8	17.6	0.4	45.5	39.9	1,039,640
10-year total	3,739	100.0	141	1,754	1,662	176	6			
10-year average	373.9		14.1	175.4	166.2	17.6	0.6	49.3	37.6	993,952

NUMBER OF FIRES

The number of forest fires or their rate of occurrence is naturally the first statistical item to be considered. The variation in the number of fires per season or other unit of time, the relative number of fires in proportion to the area of woods protected, and the number of fires in one subdistrict, fire unit, or state as compared with the number in other subdistricts, fire units, and states is not only one of the simplest factors in the fire problem and the most easily determined, but it is also one of the most important.

The number of fires indicates the so-called "risk of kindling". Since there always seem to be people and agencies in the woods whose condition, operation, mode of doing things, and attitude of mind are conducive to the starting of fires in the woods, the presence or the absence of dry fuel seems to be the most immediate controlling factor which determines the number of fires. Fuels are present in abundance in most wooded areas, and the question as to whether they are dry enough to burn and will readily ignite depends on the time of the year and the sun, wind, relative humidity, and general weather conditions

The importance of weather as a controlling factor can easily be demonstrated by comparing the rate of occurrence of fires in adjoining states. Even where the forest types, soil, litter, and social conditions are unlike, the trends upward and downward in the rate of occurrence show a striking similarity. For example, although the fire districts of Michigan and Ohio are not less than 400 miles apart and general woods conditions are very unlike, the fluctuations in the rate of occurrence of fires per year were found to be very much alike. In order to account for the parallel curves of occurrence it is necessary to conclude that weather is the main controlling factor in the fire situation. Dry years and wet years in Michigan coincide rather closely with dry years and wet years in Ohio, even though the fire seasons do not correspond very closely. The following tabulation illustrates clearly the parallel rates of occurrence of fires in Michigan and Ohio over a 5-year period.

	Per cent of total number of reported fires					
	1923	1924	1925	1926	1927	Total
Michigan	12.1	17.4	35.1	13.8	21.6	100
Ohio	15.6	19.3	29.5	16.2	19.4	100

Table 2 and Figure 2 show the total number of reportable fires that were extinguished by the Division of Forestry assisted by the deputy wardens and cooperators prior to January 1, 1936. Fifty fires extinguished in the summer and fall of 1922 marked the actual beginning of active forest fire control. These, however, have not been included in the tables, since an arrangement by full calendar years was desired in order that comparisons with the statistics of other states might be facilitated.

The following will explain the classification by size classes used in Table 2:

Class A: fires of one-fourth acre or less
Class B: fires between one-fourth acre and 10 acres
Class C: fires of 10.1 acres to 100 acres
Class D: fires of 101 acres to 500 acres
Class E: fires of more than 500 acres

The column "per cent over 10 acres" includes all fires in classes C, D, and E. The gradual diminution of this figure indicates a substantial improvement in the efficiency of detection and suppression. It is judged that with "adequate" protection, classes D and E would be entirely eliminated, and that the number of class C fires would be very small.

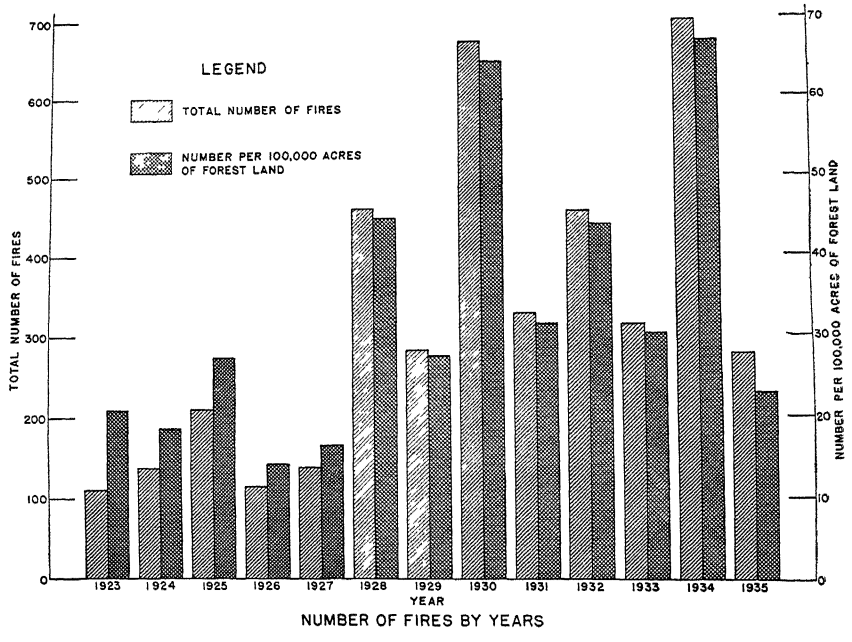

Fig. 2.—Number of fires by years, 1923 to 1935

A brief inspection of Table 2 and Figure 2 indicates a rather rapid increase in the number of recorded fires. This would be a discouraging observation were it not for the existence of some extenuating conditions which should be taken into consideration. The extension of the tower system brought about the discovery of many fires that otherwise would have escaped notice. Again, through closer field inspection, many previously unreported fires were brought to light. The local wardens have gradually become accustomed to reporting every fire they know of instead of just the big ones. There have, however, been several very severely dry fire seasons that have contributed to the large figures in recent years. Most noteworthy of these were the years 1930 and 1934.

The column headed "Number of fires per 100,000 acres of woods" contains some extremely significant figures. The rate of occurrence of forest fires expressed in this way makes possible a fair and direct comparison of the rate

TABLE 3.—Maximum, Minimum, and Average Annual Number of Fires
By counties for the 10-year period 1926 to 1935

County	Average		Maximum		Minimum	
	Number	Per cent	Number	Year of occurrence	Number	Year of occurrence
Adams	23.9	6.4	41	1934	11	1927
Scioto	109.1	29.2	250	1930	38	1927
Lawrence	65.8	17.6	122	1934	11	1926
Gallia	3.0	.8	9	1932	0	1926, 1927, 1928
Subtotal Division 1	201.8	54.0	374	1930	72	1927
Highland	1.0	.3	3	1931	0	1926,1927,1934, 1935
Pike	24.1	6.4	58	1934	6	1926
Jackson	35.5	9.5	74	1934	3	1927
Ross	25.3	6.8	48	1928	7	1927
Vinton	61.5	16.4	113	1934	19	1926
Athens	5.0	1.3	13	1930	2	1926, 1931, 1935
Hocking	18.1	4.8	41	1934	2	1926
Fairfield	1.7	.5	6	1930	1*	1928,1929,1931, 1933, 1935
Subtotal Division 2	172.2	46.0	336	1934	40	1926
Total	374.0	100.0	698	1934	115	1926

*No organization in Fairfield County in 1926-1927.

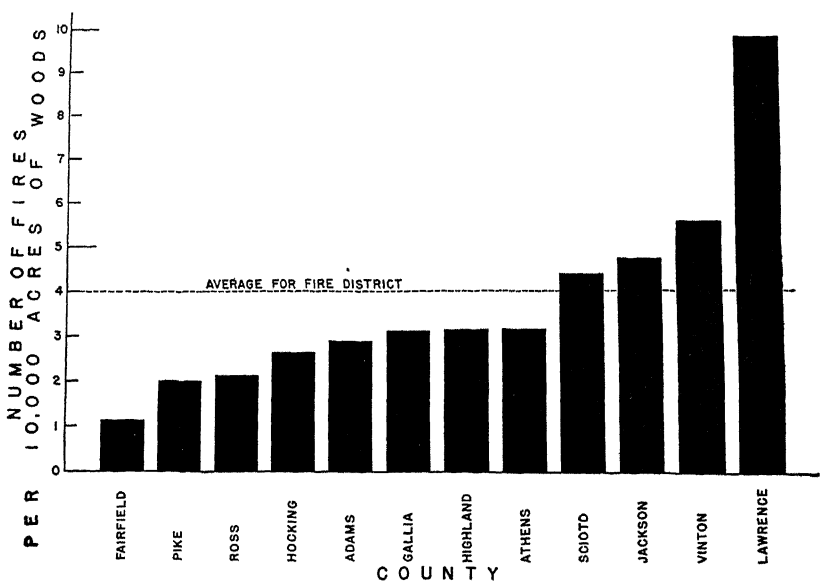

Fig. 3.—Number of fires per 10,000 acres of woods by counties, 1931 to 1935

of occurrence of fires in one state with the rate in another state. In spite of the small size of the Ohio Fire District, the rate of occurrence figures immediately classify it as an intensive fire area warranting very careful attention.

Table 3, showing the number of fires per county averaged through the 10 calendar years 1926 to 1935, although of little interest outside the State, is of great value to the organization, indicating as it does, a great variation in the fire danger from county to county. In some of the counties, the area under protection is so small that little significance attaches to the figures given. They have, however, been inserted in the table to complete the record.

In Table 4 and in Figure 3 it is seen that the rate of occurrence of fires in Lawrence County places that county in a class by itself with an excessively high risk of starting. Scioto and Vinton Counties together embrace very large wooded areas of very high rates of occurrence.

TABLE 4.—Average Annual Number of Fires

By counties for the 5-year period 1931 to 1935

County	Average number of fires per year	Per cent per county	Average number of fires per 10,000 acres of woods protected	Average number of fires per 100,000 population
Adams	26.0	6.3	2.86	372.7
Scioto	109.8	26.5	4.36	304.2
Lawrence	82.8	20.0	9.66	861.2
Gallia	4.0	0.9	3.09	663.3
Subtotal Division 1	222.6	53.7	5.04	417.7
Highland	1.0	0.2	3.12	82.6
Pike	27.0	6.5	1.99	194.7
Jackson	44.4	10.7	4.69	321.7
Ross	26.2	6.3	2.11	134.5
Vinton	64.8	15.7	5.26	631.7
Athens	3.8	0.9	3.14	197.9
Hocking	23.2	5.6	2.61	328.8
Fairfield	1.8	0.4	1.12	46.9
Subtotal Division 2	192.2	46.3	3.22	269.4
Total	414.8	100.0	3.99	332.7

Note: Acreage and population figures apply only to those portions of county within the limits of the Forest Fire District. Population according to the 1930 Census.

Figure 4 shows the distribution of reportable fires occurring in 1934, the worst fire year. A glance at this map drives home the fact that the outstanding feature with reference to Ohio fires is their large number. The presence of several distinct "hot spots" or concentrations, some of which extend over considerable areas, will be noted. There is a strong tendency for the spot or occurrence map to maintain the same general pattern year after year. However, educational, regulatory, and law enforcement activities should seek to bring about a gradual reduction of these hot spots. Just as it is wise to attack the hottest end of the individual fire first, it would seem that prevention activities should try to reduce the rate of occurrence at the hot spots first. More specific information about each of these zones of high risk will be obtained from the spot or occurrence maps which are arranged under the chapter on causes.

TABLE 5.—Total and Average Number of Fires

By counties for the 13 years of protection 1923 to 1935

County	Total number of fires	Per cent of total of number of fires	Total number of fires by periods			Average number of fires per year			Per cent of total number of fires		
	1923–1935		1923–1925	1926–1930	1931–1935	1923–1925	1926–1930	1931–1935	1923–1925	1926–1930	1931–1935
Adams	309	7.4	70	109	130	23.3	21.8	26.0	15.3	6.5	6.3
Scioto	1,295	30.8	204	542	549	68.0	108.4	109.8	44.5	32.6	26.5
Lawrence	689	16.4	31	244	414	10.3	48.8	82.8	6.8	14.7	20.0
Gallia	32	.8	2	10	20	.7	2.0	4.0	.4	.6	.9
Subtotal Division 1	2,325	55.4	307	905	1,113	102.3	181.0	222.6	67.0	54.4	53.7
Highland	10	.2	.....	5	5	.....	1.0	1.0	.....	.3	.2
Pike	277	6.6	36	106	135	12.0	21.2	27.0	7.9	6.4	6.5
Jackson	355	8.5	.....	133	222	.....	26.6	44.4	.....	7.9	10.7
Ross	290	6.9	37	122	131	12.3	24.4	26.2	8.1	7.3	6.3
Vinton	675	16.1	61	290	324	20.3	58.0	64.8	13.3	17.4	15.7
Athens	61	1.4	11	31	19	3.7	6.2	3.8	2.4	1.9	.9
Hocking	187	4.5	6	65	116	2.0	13.0	23.2	1.3	3.9	5.6
Fairfield	17	.4	.....	8	9	.....	1.6	1.8	.....	.5	.4
Subtotal Division 2	1,872	44.6	151	760	961	50.3	152.0	192.2	33.0	45.6	46.3
Total	4,197	100.0	458	1,665	2,074	152.7	333.0	414.8	100.0	100.0	100.0

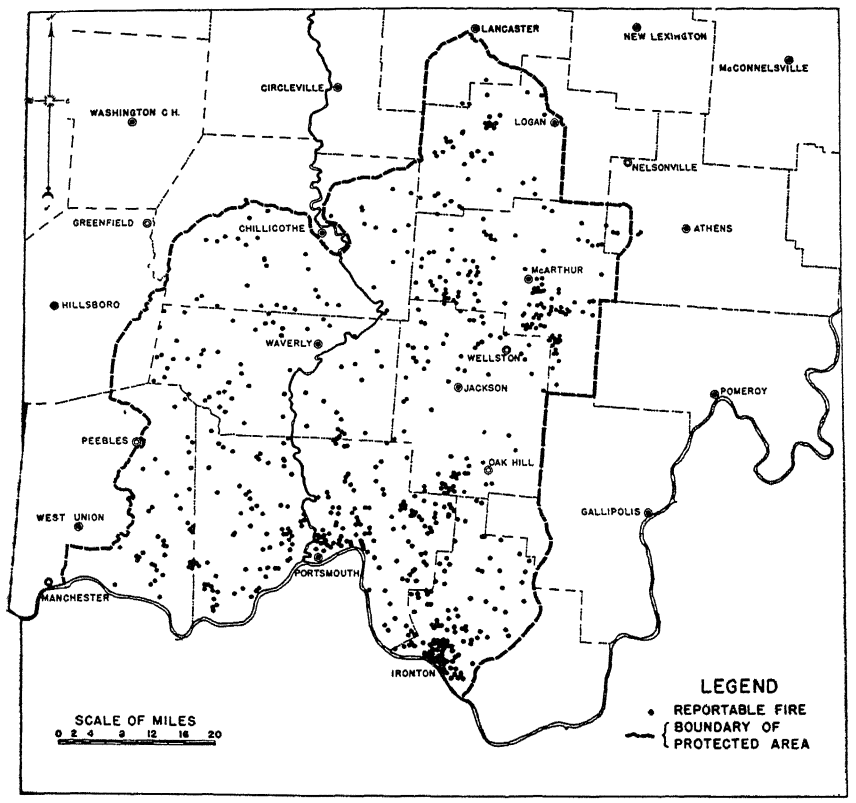

Fig. 4.—Location of fires of all causes, 1934

AREA BURNED

Although the number of fires indicates the "risk of starting", the area burned represents the "risk of burning", and is a truer index of fire danger. The area burned is enhanced by a high rate of spread plus inefficiency or inadequacy of detection and suppression. It is reduced when the rate of spread is low and when detection and suppression forces are adequate and efficiently coordinated. The figures of area burned have not always been reliable, especially in the years prior to 1927, at which time a "post-mortem" examination by the division warden became the regular procedure.

Figure 5 is derived from Table 6 and indicates a healthy trend toward smaller area per fire. The relatively low area per fire in 1934, the worst year on record in point of number of fires, is due to the availability of the Civilian Conservation Corps for fire suppression, and to the extension of the tower system as one of the approved CCC projects. The total area of woods burned, however, is very much higher than it should be even in relatively wet years. Each thousand acres of woods indicated in the graph represents approximately

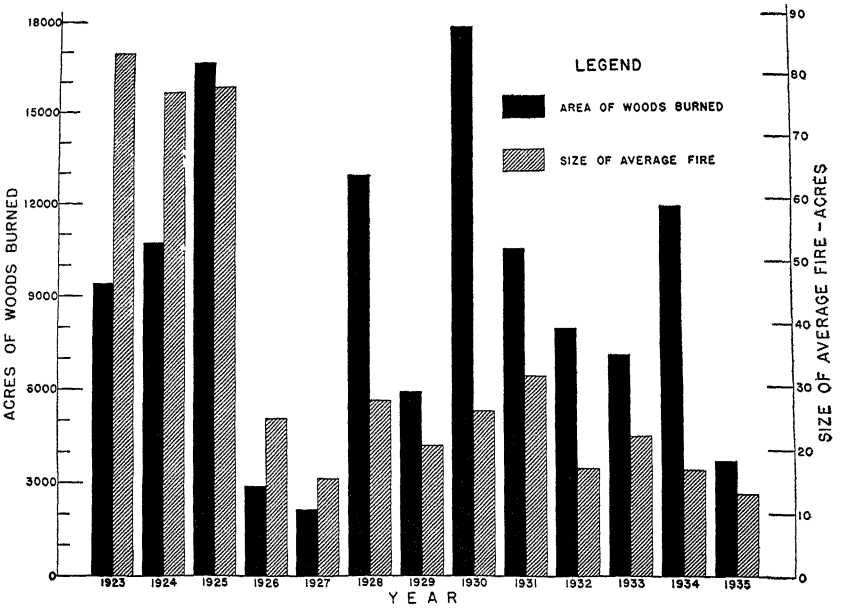

Fig. 5.—Area of woods burned and size of average fire by years, 1923 to 1935

TABLE 6.—Area of Woods Burned

By years

Year	Area of woods burned, acres	Total area burned, acres	Per cent of woods area burned	Size of average fire, acres	
				Woods	Total
1923	9,387.5	10,435.2	1.76	84.6	94.0
1924	10,697.5	11,397.8	1.46	78.1	83.2
1925	16,579.2	19,259.2	2.17	78.9	91.7
3-year total	36,664.2	41,092.2	5.42	.....	.....
3-year average	12,221.4	13,697.4	1.81	80.1	89.7
1926	2,882.2	3,421.4	.36	25.1	29.7
1927	2,153.8	2,729.5	.26	15.6	19.8
1928	12,844.6	16,314.6	1.25	28.0	35.5
1929	5,875.5	8,419.9	.57	20.8	29.8
1930	17,679.7	22,346.4	1.70	26.3	33.3
5-year total	41,435.8	53,231.8	4.37	.....	.....
5-year average	8,287.2	10,646.4	.87	24.9	32.0
1931	10,438.1	11,789.1	1.00	31.8	35.9
1932	7,868.8	9,452.2	.76	17.3	20.7
1933	7,025.4	8,785.4	.68	22.3	27.9
1934	11,793.3	15,060.7	1.13	16.9	21.6
1935	3,673.3	5,089.7	.35	13.2	18.3
5-year total	40,798.9	50,177.1	3.92	.....	.....
5-year average	8,159.8	10,035.4	.78	19.7	24.2
10-year total	82,234.7	103,407.9	8.27	.....	.....
10-year average	8,223.5	10,340.8	.83	22.0	27.6

one-tenth of 1 per cent of the woods area protected. If one-tenth of 1 per cent of the woods area protected is accepted as the limit of allowable burn under adequate protection, a very great reduction both in total area burned and in area per fire will be required to attain this result. A further requisite would be a substantial reduction in the rate of occurrence of fires through education, law enforcement, and general fire prevention propaganda. Since the tower system has not yet been perfected, and since fire prevention activities have not as yet been carried very far, it is difficult to estimate to what degree present results can be improved. There can be no question that future results under a more adequate budget would bring high returns in the form of a much lowered rate of burning.

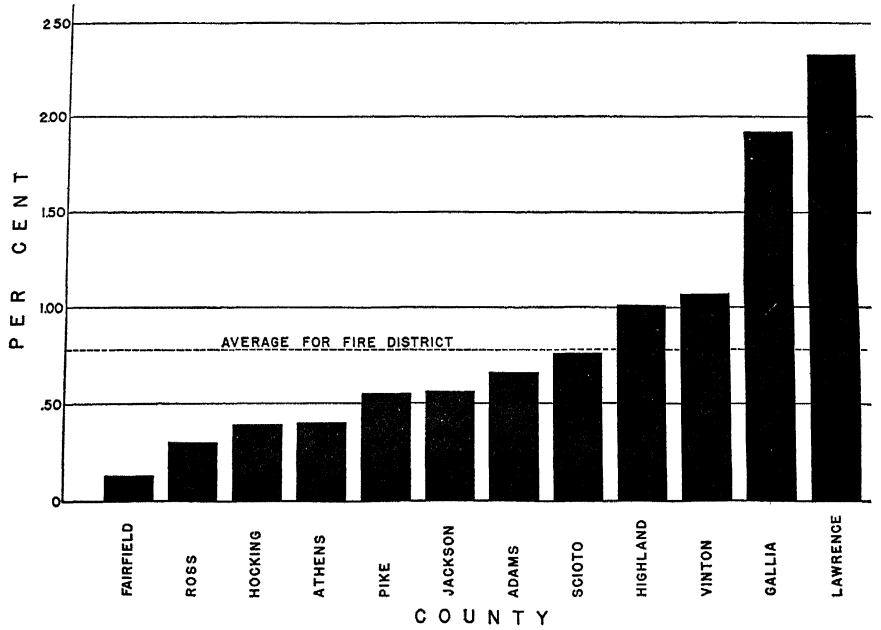

Fig. 6.—Per cent of protected woods area burned in each county per year, 1931 to 1935

Figure 6, "Per cent of protected woods area burned per year by counties, 1931 to 1935", is derived from Table 8. It indicates which counties have suffered the severest losses from woods area burned, and in which counties fire control has been most successful in reducing area burned. Of course this figure is closely related also to the factor of local cooperation. Present indications are that local cooperation is rapidly improving in both Lawrence and Vinton Counties.

Figure 7, "Size of the average fire by counties, 1931 to 1935", places the emphasis upon relative efficiency of the fire detection and suppression forces. However, in those counties afflicted with many incendiary fires, the efficiency of the organization may be greater than this chart indicates, since incendiary

fires are commonly helped along by the person responsible and one large incendiary fire not infrequently results from the merging of several small ones which cannot be identified after they have burned together.

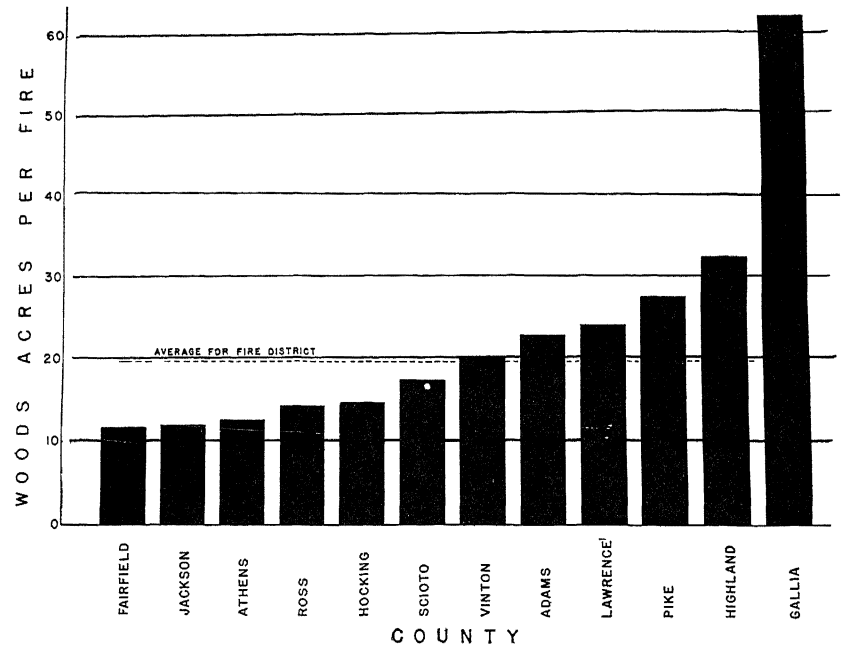

Fig. 7.—Size of the average fire by counties, 1931 to 1935

Table 7, "Average, maximum, and minimum woods area burned by counties for the 10-year period 1926 to 1935", is self-explaining.

DAMAGE

The figures of damage to woods due to fire injury are much less reliable than any other figures quoted, because this item is very difficult to determine correctly. In general, the damage has been based upon a swift ocular estimate, usually within a few days after the fire. The full effect of the fire can seldom be accurately judged so soon. The estimate is usually based upon the supposed effect of the fire upon the sale value of the land. The sale value of the land and the sale value of the timber are usually considered to be almost equivalent; the land value is very small apart from the timber. Where state forest lands are involved, such an estimate or appraisal can hardly be accepted, and in such cases the damage figure is usually stepped up. So far, no attempt has been made to base damage estimates upon the anticipated value of the stand when mature. No practicable means for quick and reasonably accurate appraisal of fire damage seems to be available. In general, it is believed that the damage figures err in being too conservative. Future observation and study with reference to fire damage are urgently needed in order to discover a more reliable method and technique for its determination.

TABLE 7.—Average, Maximum, and Minimum Woods Area Burned

By counties for the 10-year period 1926 to 1935

County	Average		Maximum		Minimum	
	Woods area burned, acres	Per cent	Woods area burned, acres	Year of occurrence	Woods area burned, acres	Year of occurrence
Adams	647.1	7.9	2,016.0	1930	130.0	1935
Scioto	2,195.0	26.7	4,750.4	1930	830.4	1927
Lawrence	1,845.6	22.4	3,213.1	1930	490.5	1927
Gallia	156.8	1.9	498.0	1935	15.0	1933*
Subtotal Division 1	4,844.5	58.9	10,132.5	1930	1,464.4	1927
Highland	21.2	.3	136.0	1932	.....	1934–1935†
Pike	592.1	7.2	1,234.5	1933	94.0	1926
Jackson	685.5	8.3	2,333.0	1928	70.0	1927‡
Ross	379.1	4.6	1,176.5	1928	63.4	1927
Vinton	1,316.4	16.0	3,987.7	1930	229.1	1927
Athens	89.4	1.1	366.0	1928	11.0	1933
Hocking	274.0	3.3	903.3	1934	40.5	1929
Fairfield	21.6	.3	77.6	1930	2.0	1933†
Subtotal Division 2	3,379.3	41.1	7,547.2	1930	689.4	1927
Total	8,223.8	100.0	17,679.7	1930	2,153.8	1927

*No fire control organization in 1926, 1927, or 1928.
†No fire control organization in 1926-1927.
‡No fire control organization in 1926 and little in 1927.

TABLE 8.—Average Annual Woods Area Burned

By counties

County	Average woods area burned per year, acres			Per cent of protected woods area burned per year			Size of average fire, acres, woods area only		
	1923–1925	1926–1930	1931–1935	1923–1925	1926–1930	1931–1935	1923–1925	1926–1930	1931–1935
Adams	1,178.6	698.4	595.8	1.66	0.78	0.66	50.5	32.0	22.9
Scioto	3,371.1	2,483.5	1,906.4	1.47	.99	.76	49.6	22.9	17.4
Lawrence	1,266.3	1,696.3	1,994.9	5.43	2.32	2.33	122.5	34.8	24.1
Gallia	266.7	64.6	249.1	.....	.83	1.92	400.0	32.3	62.3
Subtotal Division 1	6,082.7	4,942.8	4,746.2	1.88	1.17	1.08	59.4	27.3	21.3
Highland	.....	10.0	32.4	.....	.31	1.01	.....	10.0	32.4
Pike	1,019.5	442.1	742.2	.76	.33	.55	85.0	20.9	27.5
Jackson	.....	837.8	533.2	.....	1.47	.56	.....	31.5	12.0
Ross	417.6	382.9	375.2	3.96	.31	.30	33.9	15.7	14.3
Vinton	3,779.9	1,312.6	1,319.5	4.39	1.12	1.07	185.9	22.6	20.3
Athens	70.0	131.0	47.9	.58	1.08	.40	19.1	21.1	12.6
Hocking	851.7	205.9	342.1	7.10	.29	.39	425.8	15.8	14.7
Fairfield	.....	22.1	21.1	.....	.23	.13	.....	13.8	11.7
Subtotal Division 2	6,138.7	3,344.4	3,413.6	1.74	.64	.57	122.2	22.0	17.7
Total	12,221.4	8,287.2	8,159.8	1.81	.87	.78	80.1	24.9	19.7

Table 9 shows "Damage resulting from forest fires by years, 1923 to 1935". The years of the heaviest losses were 1925, 1928, and 1930. Smaller but still severe losses were also sustained in 1923, 1924, 1931, and 1934. The relative amount of fire damage per year is indicated in Figure 8. In this graph, the steep decline of the average loss per year for the successive 3- and 5-year periods is particularly gratifying. However, Table 9 indicates that the figure of damage per woods acre burned has been lowered by a dollar or more per acre since 1930 for no apparent reason, so that the true degree of reduction in loss probably is not as great as the graph indicates. It seems quite unlikely that the damage figures for the years 1931 to 1935 can be in excess of the actual loss sustained, since the average figure of loss per woods acre burned ranges between $1.32 and $1.87.

TABLE 9.—Damage Resulting from Forest Fires

By years, 1923 to 1935

Year	Total number of fires	Damage to nearest whole dollar			Damage to woods		
		To woods	Per cent of decade	Other	Per fire, dollars	Per woods acre burned, dollars	Per protected acre, mills
1923	111	25,380	.....	770	228.65	2.62	47.69
1924	137	26,166	.....	280	191.20	2.40	35.73
1925	210	47,198	.....	1,259	224.75	2.76	61.73
3-year total	458	98,744	.....	2,309	.....	.....	.....
3-year average	152.7	32,915	.....	770	215.60	2.62	48.67
1926	115	7,660	4.1	260	66.61	2.58	9.44
1927	138	4,653	2.5	2,817	33.72	2.08	5.55
1928	459	43,150	23.0	6,157	94.01	3.22	42.06
1929	282	15,625	8.4	2,537	55.41	2.48	15.23
1930	671	49,925	26.6	3,796	74.40	2.74	48.02
5-year total	1,665	121,013	64.6	15,567	.....	.....	.....
5-year average	333.0	24,203	.....	3,113	72.68	2.80	25.52
1931	328	19,773	10.5	829	60.28	1.87	19.02
1932	456	12,125	6.5	385	26.59	1.46	11.66
1933	314	9,748	5.2	409	31.04	1.32	9.38
1934	698	19,351	10.3	1,356	27.72	1.55	18.61
1935	278	5,428	2.9	1,392	19.53	1.48	5.22
5-year total	2,074	66,425	35.4	4,371	.....	.....	.....
5-year average	414.8	13,285	.....	874	32.01	1.63	12.78
10-year total	3,739	187,437	100.0	19,938	.....	.....	.....
10-year average	373.9	18,744	... .	1,994	50.12	2.28	18.86

In the last column of Table 9 damage is expressed in terms of mills per protected woods acre. The damage per protected woods acre has apparently ranged from ½ to 2 cents per year during the last 5 years.

The greatest loss sustained per average fire is shown as $228.65 in 1923. The least average loss per fire was $19.53 in 1935. A measure of satisfaction may be derived from the fact that although the rate of occurrence of fires has been going up, the rate of loss has been coming down. This of course is the natural outcome of efficient control and the reduction in the size of the average fire.

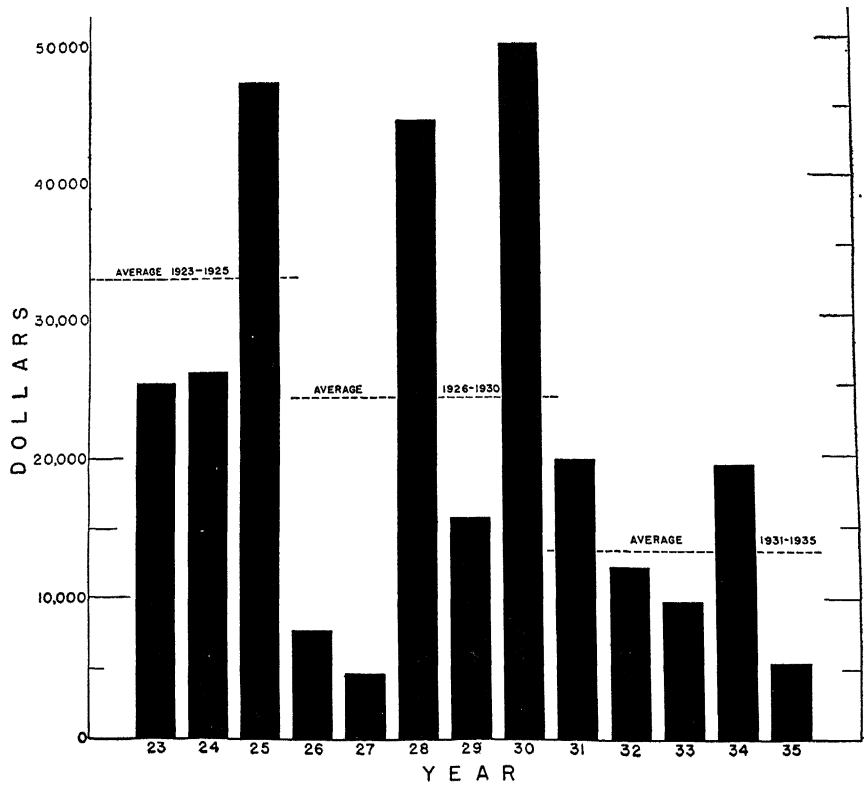

Fig. 8.—Damage to woods by years, 1923 to 1935

TABLE 10.—Average, Maximum, and Minimum Annual Woods Damage
By counties for the 10-year period 1926 to 1935

County	Average		Maximum		Minimum	
	Woods damage, dollars per year	Per cent	Woods damage, dollars	Year	Woods damage, dollars	Year
Adams	1,667	8.9	7,489	1930	264	1935
Scioto	5,351	28.6	14,238	1930	293	1927
Lawrence	3,638	19.4	8,314	1930	908	1935
Gallia	270	1.4	550	1930	35	1933*
Subtotal Division 1	10,926	58.3	30,591	1930	3,081	1927
Highland	32	.2	210	1932	.....	1934–1935†
Pike	1,414	7.5	2,965	1930	241	1927
Jackson	1,955	10.4	9,329	1928	156	1935‡
Ross	937	5.0	3,657	1928	85	1927
Vinton	2,580	13.8	9,168	1930	527	1927
Athens	211	1.1	1,010	1928	18	1933, 1935
Hocking	621	3.3	2,303	1934	53	1929
Fairfield	68	.4	292	1932	1	1933†
Subtotal Division 2	7,818	41.7	19,334	1930	1,572	1927
Total	18,744	100.0	49,925	1930	4,653	1927

*No fire control organization in 1926, 1927, or 1928.
†No fire control organization in 1926-1927.
‡No fire control organization in 1926 and little in 1927.

TABLE 11.—Total and Average Annual Woods Damage, Woods Damage per Fire, and Woods Damage per Woods Acre Burned
By counties, 1923 to 1935

County	Total woods damage, 1923–1935		Average woods damage per year, dollars			Woods damage per fire, dollars			Woods damage per woods acre burned, dollars
	Dollars	Per cent	1923–1925	1926–1930	1931–1935	1923–1925	1926–1930	1931–1935	1923–1935
Adams	26,092	9.1	3,140	2,378	956	134.57	109.08	36.78	2.61
Scioto	82,674	28.8	9,721	7,227	3,475	142.96	66.67	31.64	2.58
Lawrence	47,637	16.7	3,754	4,545	2,730	363.23	93.14	32.98	2.14
Gallia	4,305	1.5	533	208	333	800.00	104.00	83.25	1.82
Subtotal Division 1	160,708	56.1	17,148	14,358	7,494	167.57	79.33	33.67	2.41
Highland	319	.1	.....	18	46	.....	17.60	46.20	1.50
Pike	23,825	8.3	3,228	1,393	1,435	269.06	65.98	53.15	2.65
Jackson	19,549	6.8	.....	3,120	790	.....	117.29	17.79	2.85
Ross	12,727	4.5	1,119	1,334	540	90.73	54.66	20.63	2.52
Vinton	53,746	18.8	9,318	3,101	2,058	458.23	53.46	31.76	2.19
Athens	2,848	1.0	245	362	61	66.82	58.32	16.05	2.58
Hocking	11,778	4.2	1,857	460	782	928.33	35.42	33.67	2.22
Fairfield	682	.2	.....	57	79	.....	35.88	43.89	3.16
Subtotal Division 2	125,474	43.9	15,767	9,845	5,791	313.24	64.76	30.14	2.40
Total	286,182	100.0	32,915	24,203	13,285	215.60	72.68	32.03	2.41

Tables 10, 11, and 12 show fire damage statistics according to county. The maximum damage per year in any county is given in Table 10 as $14,238 for Scioto County in 1930. Jackson County sustained a loss of $9,329 in 1928 and Vinton County, a loss of $9,168 in 1930. Under average damage per county, Scioto County again heads the list, followed by Lawrence, Vinton, Jackson, and Adams. Table 11 shows "Total and average annual woods damage, woods damage per fire, and woods damage per woods acre burned" for each county from 1923 to 1935; the heavy losses show up in the same counties as in Table 10. Table 12, showing "Average annual damage per acre of protected forest land by counties", provides a particularly valuable gauge of relative effectiveness of fire control measures in the various counties. Provisions for fire control have evidently not been as effective as they should be in Lawrence and Gallia Counties. This may be due to inadequacy of protective measures, lack of public cooperation, or both.

TABLE 12.—Average Annual Damage per Acre of Protected Forest Land

By counties

County	Damage per acre of protected forest land, mills		
	1923–1925	1926–1930	1931–1935
Adams	44.11	26.72	10.53
Scioto	42.35	28.69	13.79
Lawrence	160.84	62.21	31.86
Gallia	.....	26.74	25.69
Division 1	52.91	34.05	16.98
Highland	.....	5.62	14.38
Pike	23.96	10.24	10.55
Jackson	.....	54.88	8.34
Ross	10.62	10.93	4.36
Vinton	108.24	26.55	16.67
Athens	20.26	29.95	5.06
Hocking	154.75	6.58	8.80
Fairfield	.....	5.94	4.94
Division 2	44.76	18.70	9.68
Total	48.67	25.52	12.78

COST OF SUPPRESSION

The cost of suppression, or actual expenses incurred by the State in the extinguishment of fires, is not subject to estimation but is accurate to the penny. This item does not include the cost of maintaining the organization, the cost of detection, or other general items of cost, but only the actual expenditures directly occasioned by any given fire or fires for labor, transportation, food, telephone toll charges, and other incidental costs if any.

Table 13 gives the "Cost of suppression by years, 1923 to 1935", and these figures are further emphasized in Figure 9. Attention should be called to the year 1930, when suppression costs reached an all-time high of $10,269.09, or nearly 32 per cent of the total cost of suppression from 1926 to 1935. The very low cost of suppression for the years 1933, 1934, and 1935 should be explained. This condition is due first to the lack of State funds with which to pay fire suppression labor, and second to the presence of the CCC forestry and erosion

control camps in the Fire District. Owing to the presence of these camps, which were run by Federal funds, and to the availability of their personnel for fire prevention and suppression activities, gains in fire suppression performance were still possible in the absence of the usual State funds. If State funds also had been available, much time would have been gained in making the initial attack. Entire reliance upon CCC labor often occasioned delays that might have been reduced by partial dependence upon registered crews nearer the scene of the fire.

TABLE 13.—Cost of Suppression

By years, 1923 to 1935

Year	Total number of fires	Cost of suppression		Cost per fire, dollars	Cost per woods acre burned, dollars	Cost per protected woods acre, mills
		Amount, dollars	Per cent of decade			
1923	111	1,544.73	.....	13.92	0.16	2.90
1924	137	2,690.65	.....	19.64	.25	3.67
1925	210	3,489.61	.....	16.62	.20	4.56
3-year total	458	7,724.99	.....	.....	.....	.....
3-year average	152.7	2,575.00	.....	16.87	.21	3.81
1926	115	1,245.37	4.0	10.83	.42	1.54
1927	138	1,397.10	4.3	10.12	.62	1.67
1928	459	6,188.39	19.2	13.48	.46	6.03
1929	282	2,633.30	8.2	9.34	.42	2.57
1930	671	10,269.09	31.8	15.30	.56	9.87
5-year total	1,665	21,733.25	67.5	.....	.....	.....
5-year average	333.0	4,346.65	.....	13.05	.50	4.58
1931	328	4,466.27	13.9	13.62	.42	4.29
1932	456	3,692.37	11.4	8.10	.44	3.55
1933	314	982.68	3.0	3.13	.13	.95
1934	698	1,023.16	3.2	1.47	.08	.98
1935	278	310.38	1.0	1.12	.08	.30
5-year total	2,074	10,474.86	32.5	.....	.....	.....
5-year average	414.8	2,094.97	.....	5.05	.26	2.02
10-year total	3,739	32,208.11	100.0	.....	.....	.....
10-year average	373.9	3,220.81	.....	8.61	.39	3.24

Owing to the low cost to the State for suppression during this period, future estimates of fire suppression costs should be based on the figures for the years previous to 1933 while the State was carrying the total cost of suppression. Although the average cost per fire can be closely approximated in advance as somewhere between $12 and $15, it is impossible to estimate how many fires will occur during any given future period, since this depends so largely upon the weather conditions. This figure, however, may be employed to estimate the probable additional cost of extending the Fire District into new territory, especially if something is known in advance concerning the probable rate of occurrence of fires.

Attention is called to the last column of Table 13, which indicates that even in the worst years, like 1930, the cost of suppression is less than 1 cent per acre of woodland protected. Of course, to obtain the total cost of protection the cost of detection, supervision of wardens, investigation of fires, tools, towers, telephone lines, equipment, office and travel expenses, and the like must be

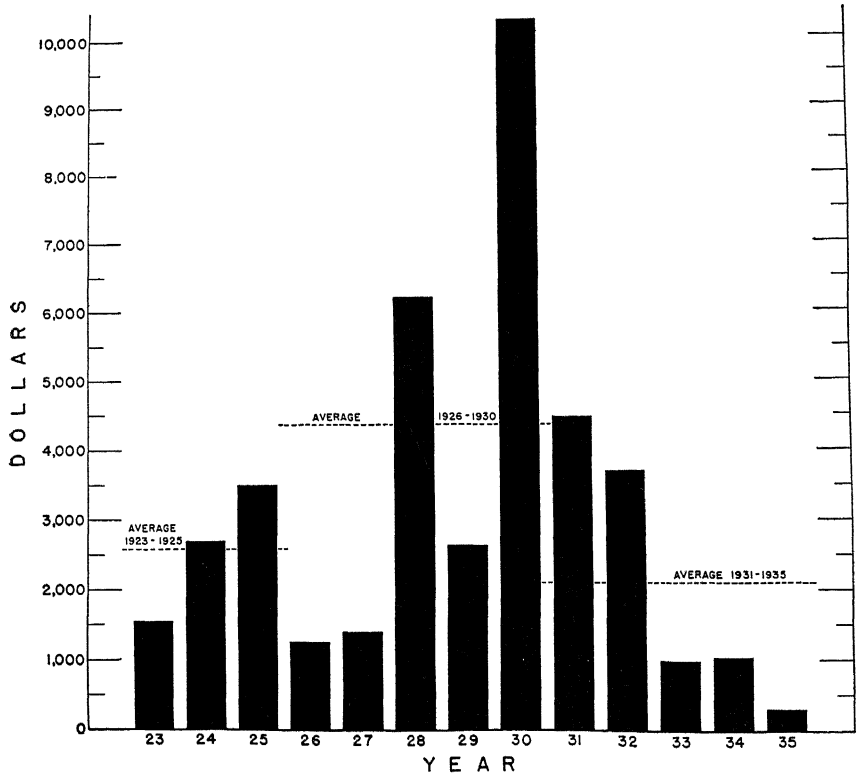

Fig. 9.—Cost of suppression by years, 1923 to 1935

added. The total annual cost of operating the fire system in Ohio at the present time is between 1½ and 2½ cents per woods acre protected. It is estimated that "adequate" protection in the present Fire District would cost from 4 cents to 5 cents per acre.

Tables 14, 15, and 16 analyze the cost of suppression by counties. Particular attention should be given to the unusually high cost of suppression in Scioto County. A glance at the cost per fire columns assures one that this is not due to inefficiency or intrinsic difficulties in control, but rather to the large number of fires in that county (see Tables 4 and 5). The second most expensive county is Lawrence, only eight townships of which are within the Fire District. Other counties in order of costliness are Vinton, Adams, and Pike, all over $3,500 for the 13-year period.

The cost of suppression per acre of protected forest land featured in Table 16 calls attention to the unusually high cost of suppression in Lawrence County prior to 1930. Although still in the lead during 1931 to 1935, this county has shown much improvement and the figure now appears to be nearly normal.

TABLE 14.—Average, Maximum, and Minimum Annual Cost of Suppression By counties for the 10-year period 1926 to 1935

County	Average		Maximum		Minimum	
	Cost of suppression, dollars per year	Per cent	Cost of suppression, dollars	Year	Cost of suppression, dollars	Year
Adams	284.63	8.8	803.12	1930	25.36	1935
Scioto	1,122.16	34.9	3,596.02	1930	96.34	1935
Lawrence	479.53	14.9	1,418.42	1930	60.16	1935
Gallia	28.56	.9	60.43	1930	4.39	1933*
Subtotal Division 1	1,914.88	59.5	5,877.99	1930	198.99	1935
Highland	12.13	.4	42.50	1928	.....	1934-1935†
Pike	284.15	8.8	1,082.25	1930	16.07	1935
Jackson	241.00	7.5	743.76	1930	13.82	1935‡
Ross	215.07	6.7	636.59	1930	28.76	1935
Vinton	387.41	12.0	1,387.99	1930	33.87	1935
Athens	35.73	1.1	137.90	1930	4.76	1935
Hocking	110.88	3.4	241.51	1930	14.11	1935
Fairfield	19.56	.6	60.43	1930	.....	1928†
Subtotal Division 2	1,305.93	40.5	4,391.10	1930	111.39	1935
Total	3,220.81	100.0	10,269.09	1930	310.38	1935

*No fire control organization in 1926, 1927, or 1928.
†No fire control organization in 1926-1927.
‡No fire control organization in 1926 and little in 1927.

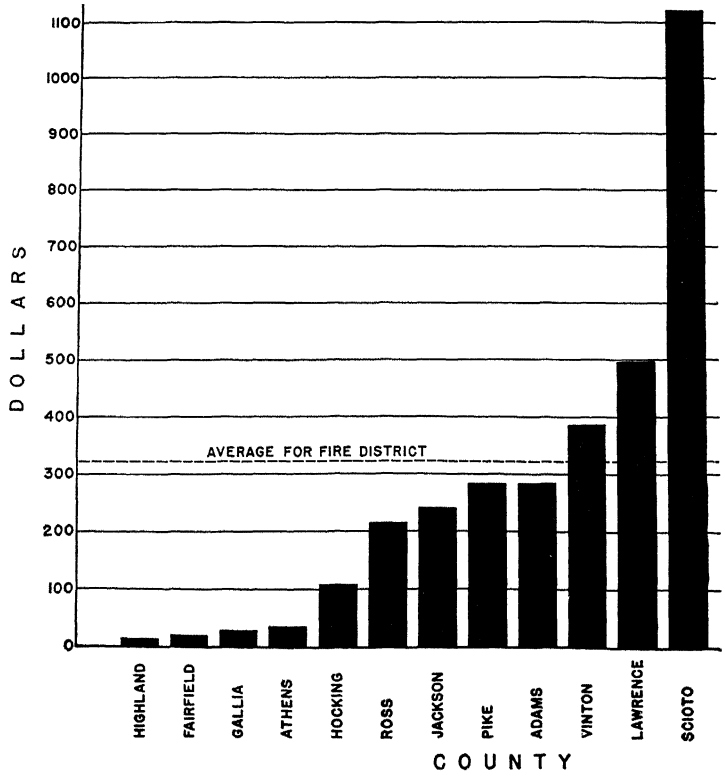

Fig. 10.—Average annual cost of suppression by counties, 1926 to 1935

TABLE 15.—Total and Average Annual Cost of Suppression

By counties, 1923 to 1935

County	Total cost 1923–1935		Average cost per year, dollars			Cost per fire, dollars			Cost per woods acre burned, dollars
	Dollars	Per cent	1923–1925	1926–1930	1931–1935	1923–1925	1926–1930	1931–1935	1923–1935
Adams	4,011.52	10.1	388.41	376.44	192.82	16.65	17.27	7.42	0.40
Scioto	14,158.07	35.8	978.83	1,556.58	687.73	14.39	14.36	6.26	.44
Lawrence	5,294.47	13.2	166.39	620.12	338.94	16.10	12.71	4.09	.25
Gallia	341.75	.9	18.72	22.46	34.65	28.08	11.23	8.66	.14
Subtotal Division 1	23,805.81	60.0	1,552.35	2,575.61	1,254.14	15.17	14.23	5.63	.36
Highland	121.34	.3	.....	17.55	6.72	.....	17.55	6.72	.57
Pike	3,642.99	9.2	267.17	380.66	187.63	22.26	17.95	6.95	.41
Jackson	2,410.03	6.1	.....	321.67	160.34	.....	12.09	3.61	.35
Ross	2,806.09	7.1	218.79	313.88	116.27	17.71	12.86	4.44	.58
Vinton	4,976.61	12.6	334.17	494.46	280.36	18.07	8.53	4.33	.20
Athens	393.62	1.0	12.10	60.85	10.61	3.30	9.82	2.79	.36
Hocking	1,281.06	3.2	57.42	146.63	75.13	28.71	11.28	3.23	.24
Fairfield	195.55	.5	.....	35.34	3.77	.....	22.08	2.10	.90
Subtotal Division 2	15,827.29	40.0	922.64	1,771.04	840.83	18.33	11.65	4.37	.30
Total	39,633.10	100.0	2,474.99	4,346.65	2,094.97	16.21	13.05	5.05	.33

TABLE 16.—Average Annual Cost of Suppression per Acre of Protected Forest Land

By counties

County	Cost per acre of protected forest land, mills		
	1923–1925	1926–1930	1931–1935
Adams	5.46	4.23	2.12
Scioto	4.26	6.18	2.73
Lawrence	7.13	8.49	3.96
Gallia	.....	2.89	2.67
Division 1	4.79	6.11	2.84
Highland	.....	5.48	2.10
Pike	1.98	2.80	1.38
Jackson	.....	5.66	1.69
Ross	2.08	2.57	.94
Vinton	3.88	4.23	2.27
Athens	1.00	5.03	.88
Hocking	4.78	2.10	.85
Fairfield	.....	3.68	.24
Division 2	2.62	3.36	1.41
Total	3.66	4.58	2.02

STATISTICS BY TEN-DAY PERIODS

No information is much more useful in directing fire control activities than at what time of year fires are to be expected to occur, and what periods are relatively the most important. The general features of the fire year as to number of fires and area burned are shown in Figure 11, which gives the per cent of number of fires and woodland area burned in the Forest Fire District by months for the years 1931 to 1935. This graph shows that the most fires and the largest fires occur during April, May, and November, with April far in the lead and the other 2 months about equal. The graph also shows that at no time of the year is there entire freedom from fires but that fires may and do occur during every month. Particular note should be taken of the fact that fires are much more numerous during December, January, and February than during June, July, August, and September. A popular misconception is evidenced by the belief that there are more fires in the fall than in the spring. This, however, is not so, since in October and November the days are much shorter and the nights colder than during March, April, and May.

These and other related facts are brought out in much greater detail in Tables 17, 18, 19, and 20, which cover the calendar year by month, 6-month, and 10-day periods. Because of the freak situation in 1930 when fires occurred in great numbers all summer, a special table (Table 22) has been prepared for that year.

It should be noted in Table 17 that in the average year 73.1 per cent of all the fires occurred during the first half of the year, and that fewer fires occurred in October than in February. It is significant that during the last 5 years there were never less than 90 fires during the month of April. The maximum figures for the fall months, however, indicate that it is necessary to be ready to handle

a large number of fires between October 21 and December 10. Although the period from March 15 to May 15 often is the spring fire season, the organization should be prepared to handle a considerable number of fires from late January to early March as well.

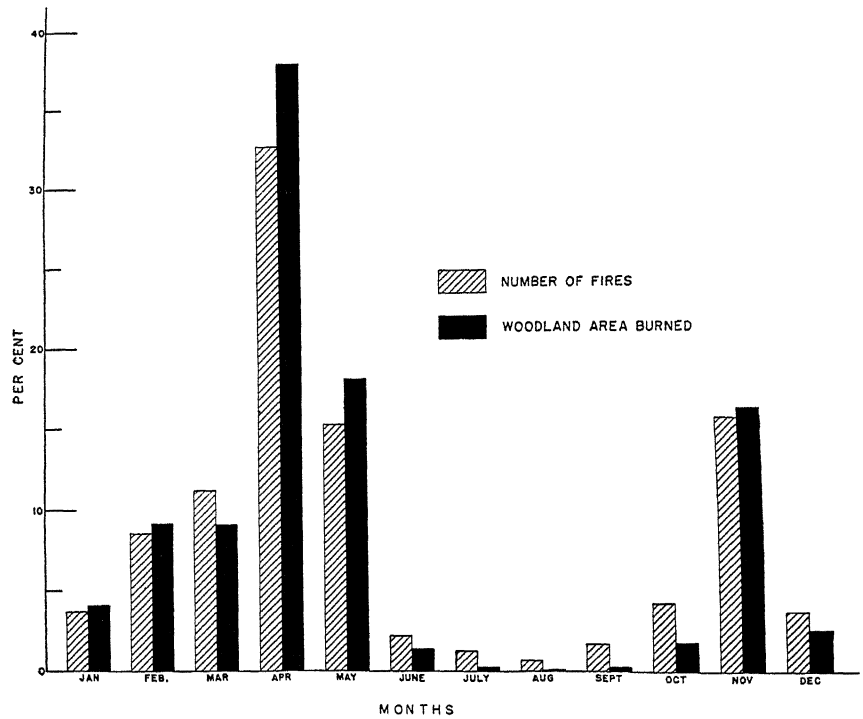

Fig. 11.—Per cent of number of fires and woodland area burned by months, 1931 to 1935

Tables 18, 19, 20, and 21 still further emphasize the facts just mentioned in connection with Table 17. In Table 18 particular attention is called to the last column, which gives the size of the average fire in acres by 10-day periods. The small size of fires from July 1 to October 31 should be particularly noted. The fires during January and February were relatively large, because the towermen were not as a rule kept on duty at that time of the year.

In Table 19 it should be noted that more than two-fifths of the year's damage takes place in April and that another two-fifths occurs during the other spring months; this leaves a scant one-fifth for the last 6 months of the year. It should also be noted that what damage does occur in the fall is concentrated in a relatively short period of time; whereas the damage during the spring months in the maximum column is extended over a very long period. Although damage is often considerable later on, a sharp break in the spring season is nearly always evident on or about May 10, at which time the foliage starts to develop very fast.

TABLE 17.—Average, Maximum, and Minimum Number of Fires
By months and 10-day periods for the 5 years 1931 to 1935

Period	Average		Maximum		Minimum	
	Number	Per cent	Number	Year of occurrence	Number	Year of occurrence
Jan. 1-10	2.8		9	1935	0	1932, 1934
11-20	3.8		8	1933	1	1932, 1935
21-31	8.6		29	1931	0	1935
Month	15.2	3.7	32	1931	2	1932
Feb. 1-10	8.8		35	1931	0	1933
11-20	3.8		10	1932	0	1931
21-28	22.8		53	1933	0	1934
Month	35.4	8.5	58	1931	6	1935
Mar. 1-10	16.2		48	1935	0	1931
11-20	10.8		33	1935	1	1931
21-31	19.0		61	1934	6	1931
Month	46.0	11.1	93	1935	7	1931
Apr. 1-10	43.8		117	1934	10	1935
11-20	37.2		80	1931	16	1933
21-30	53.8		86	1935	26	1931
Month	134.8	32.5	216	1934	90	1933
May 1-10	38.6		103	1934	4	1933, 1935
11-20	13.0		33	1932	4	1933
21-31	11.2		38	1932	0	1933
Month	62.8	15.1	126	1934	8	1933
June 1-10	3.2		8	1931	0	1933, 1935
11-20	2.8		7	1933	0	1932, 1935
21-30	3.0		8	1933	0	1935
Month	9.0	2.2	16	1931	0	1935
6 months	303.2	73.1	454	1934	211	1933
July 1-10	1.0		3	1934	0	1932, 1935
11-20	2.4		5	1931, 1933	0	1932, 1935
21-31	2.0		4	1934	0	1935
Month	5.4	1.3	9	1933, 1934	0	1935
Aug. 1-10	.8		3	1932	0	1931, 1933, 1935
11-20	1.6		7	1932	0	1931, 1934, 1935
21-31	.4		1	1932, 1933	0	1931, 1934, 1935
Month	2.8	.7	11	1932	0	1931, 1935
Sept. 1-10	1.8		6	1932	0	1931, 1933, 1935
11-20	5.0		21	1932	0	1931, 1933, 1935
21-30	.2		1	1931	0	1932, 1933, 1934, 1935
Month	7.0	1.7	27	1932	0	1933
Oct. 1-10	.2		1	1932	0	1931, 1933, 1934, 1935
11-20	2.4		7	1934	0	1931
21-31	14.8		41	1934	0	1931
Month	17.4	4.2	48	1934	0	1931
Nov. 1-10	14.8		23	1933, 1934	6	1932
11-20	26.2		84	1934	1	1935
21-30	22.8		59	1934	3	1931
Month	63.8	15.4	166	1934	15	1935
Dec. 1-10	13.0		43	1932	0	1931
11-20	1.2		3	1934	0	1932, 1933
21-31	1.0		2	1931, 1932	0	1933, 1935
Month	15.2	3.6	45	1932	4	1931, 1935
6 months	111.6	26.9	244	1934	34	1931
Year	414.8	100.0	698	1934	278	1935

TABLE 18.—Average, Maximum, and Minimum Area of Woods Burned and Size of the Average Fire

By months and 10-day periods for the 5 years 1931 to 1935

Period	Average no. of fires	Average		Maximum		Minimum		Size of average fire, acres
		Acres	Per cent	Acres	Year	Acres	Year	
Jan. 1–10..	2.8	35.2	.....	145.0	1935	0.0	1931, 1932, 1934	12.6
11–20..	3.8	33.6	.....	55.0	1931	5.0	1932	8.8
21–31..	8.6	252.3	.....	1,141.6	1931	0	1935	29.3
Month...	15.2	321.1	3.9	1,196.6	1931	43.0	1932	21.1
Feb. 1–10..	8.8	234.6	.....	1,083.0	1931	0	1933	26.7
11–20..	3.8	35.6	.....	107.7	1932	0	1931	9.4
21–28..	22.8	470.6	.....	1,031.9	1933	0	1934	20.6
Month...	35.4	740.8	9.1	1,554.7	1931	33.5	1934	20.9
Mar. 1–10..	16.2	230.4	.....	784.8	1935	0	1931	14.2
11–20..	10.8	293.0	.....	1,114.1	1935	1.0	1931	27.1
21–31..	19.0	212.1	.....	844.0	1934	24.0	1933	11.2
Month...	46.0	735.5	9.0	1,996.1	1935	28.5	1931	16.0
Apr. 1–10..	43.8	845.0	.....	1,703.9	1934	25.1	1935	19.3
11–20..	37.2	971.6	.....	2,507.2	1931	157.6	1935	26.1
21–30..	53.8	1,263.4	.....	2,231.5	1933	724.5	1932	23.5
Month...	134.8	3,080.0	37.7	4,307.5	1931	1,237.3	1935	22.8
May 1–10..	38.6	1,217.4	.....	2,924.1	1931	30.0	1935	31.5
11–20..	13.0	153.6	.....	429.0	1932	12.5	1933	11.8
21–31..	11.2	87.9	.....	253.3	1932	0	1933	7.8
Month...	62.8	1,458.9	17.9	3,085.3	1931	60.0	1935	23.2
June 1–10..	3.2	25.1	.....	88.0	1931	0	1933, 1935	7.8
11–20..	2.8	42.5	.....	171.0	1933	0	1932, 1934, 1935	15.2
21–30..	3.0	47.3	.....	217.7	1933	0	1935	15.8
Month...	9.0	114.9	1.4	388.7	1933	0	1935	12.8
6 months ..	303.2	6,451.2	79.0	10,307.1	1931	3,537.4	1935	21.3
July 1–10..	1.0	1.0	.....	2.5	1933, 1934	0	1931, 1932, 1935	1.0
11–20..	2.4	15.6	.....	36.0	1933	0	1932, 1935	6.5
21–31..	2.0	10.9	.....	28.1	1933	0	1935	5.5
Month...	5.4	27.5	.3	66.6	1933	0	1935	5.1
Aug. 1–10..	.8	1.0	.....	5.0	1932	0	1931, 1933, 1934, 1935	1.2
11–20..	1.6	4.7	.....	23.2	1932	0	1931, 1934, 1935	2.9
21–31..	.4	.4	.....	2.0	1933	0	1931, 1932, 1934, 1935	1.0
Month...	2.8	6.1	.1	28.2	1932	0	1931, 1934, 1935	2.2
Sept. 1–10..	1.8	2.8	.....	12.0	1934	0	1931, 1933, 1935	1.6
11–20..	5.0	19.4	.....	92.9	1932	0	1931, 1933, 1935	3.9
21–30..	.2	.3	.....	1.5	1931	0	1932, 1933, 1934, 1935	1.5
Month...	7.0	22.5	.3	94.9	1932	0	1933, 1935	3.2
Oct. 1–10..	.2	0.0	.....	0.0	1931, 1935	0	1931, 1932, 1933, 1934, 1935	0
11–20..	2.4	15.8	.....	69.3	1934	0	1931, 1932	6.6
21–31..	14.8	130.3	.....	476.0	1934	0	1931	8.8
Month...	17.4	146.1	1.8	545.3	1934	0	1931	8.4
Nov. 1–10..	14.8	156.9	.....	326.8	1934	34.2	1935	10.6
11–20..	26.2	426.3	.....	1,637.6	1934	0	1935	16.3
21–30..	22.8	720.8	.....	1,640.0	1934	8.5	1931	31.6
Month..	63.8	1,304.0	16.0	3,604.4	1934	46.7	1935	20.4
Dec. 1–10..	13.0	198.8	.....	872.0	1932	0	1931	15.3
11–20..	1.2	.8	.....	4.0	1931	0	1931, 1932, 1933, 1934	.7
21–31..	1.0	2.8	.....	9.0	1931	0	1933, 1934, 1935	2.8
Month...	15.2	202.4	2.5	877.0	1932	10.5	1935	13.3
6 months ..	111.6	1,708.6	21.0	4,220.2	1934	131.0	1931	15.3
Year	414.8	8,159.8	100.0	11,793.3	1934	3,673.3	1935	19.7

TABLE 19.—Average, Maximum, and Minimum Damage to Woods and Average Damage per Fire

By months and 10-day periods for the 5 years 1931 to 1935

Period	Average		Maximum		Minimum		Average damage per fire, dollars
	Damage, dollars	Per cent	Damage, dollars	Year	Damage, dollars	Year	
Jan. 1-10	26.60	.....	107.00	1935	0	1931, 1932, 1934	9.50
11-20	30.80	.....	55.00	1931	12.00	1932	8.11
21-31	299.50	.....	1,331.50	1931	0	1935	34.83
Month	356.90	2.7	1,386.50	1931	55.00	1933	23.48
Feb. 1-10	256.60	.....	1,143.00	1931	0	1933	29.16
11-20	26.60	.....	94.00	1932	0	1931, 1933	7.00
21-28	540.70	.....	1,315.50	1932	0	1934	23.71
Month	823.90	6.2	1,802.00	1931	34.00	1935	23.26
Mar. 1-10	288.00	.....	1,135.00	1935	0	1931	17.78
11-20	377.00	.....	1,333.00	1935	1.00	1931	34.91
21-31	307.00	.....	1,233.00	1934	34.00	1931	16.15
Month	972.00	7.3	2,567.00	1935	35.00	1931	21.13
Apr. 1-10	1,398.70	.....	2,775.00	1934	40.00	1935	31.93
11-20	1,908.30	.....	5,995.50	1931	201.00	1935	51.30
21-30	2,264.70	.....	3,087.00	1933	1,306.50	1932	42.09
Month	5,571.70	42.0	10,187.00	1931	2,447.00	1935	41.33
May 1-10	2,401.40	.....	5,599.00	1931	62.00	1935	62.21
11-20	335.00	.....	987.00	1932	24.00	1933	25.77
21-31	145.70	.....	502.50	1932	0	1932	13.01
Month	2,882.10	21.7	5,942.00	1931	90.00	1933	45.58
June 1-10	40.00	.....	153.00	1931	0	1933, 1935	12.50
11-20	82.20	.....	318.00	1933	0	1932, 1934, 1935	29.36
21-30	133.20	.....	635.00	1933	0	1934, 1935	44.40
Month	255.40	1.9	953.00	1933	0	1935	28.38
6 months	10,862.00	81.8	19,603.50	1931	5,301.00	1935	35.82
July 1-10	1.20	.....	5.00	1933	0	1931, 1932, 1935	1.20
11-20	42.20	.....	107.00	1933	0	1932, 1935	17.58
21-31	19.20	.....	63.00	1933	0	1935	9.60
Month	62.60	.5	175.00	1933	0	1935	11.60
Aug. 1-10	.20	.....	1.00	1932	0	1931, 1933, 1934, 1935	.25
11-20	7.90	.....	39.50	1932	0	1931, 1933, 1934, 1935	4.94
21-31	.80	.....	4.00	1933	0	1931, 1932, 1934, 1935	2.00
Month	8.90	.1	40.50	1932	0	1931, 1934, 1935	3.18
Sept. 1-10	4.80	.....	22.00	1934	0	1931, 1933, 1935	2.67
11-20	36.00	.....	176.00	1932	0	1931, 1933, 1935	7.20
21-30	.20	.....	1.00	1931	0	1932, 1933, 1934, 1935	1.00
Month	41.00	.3	178.00	1932	0	1933, 1935	5.86
Oct. 1-10	0	.....	0	.....	0	.....	0
11-20	24.60	.....	112.00	1934	0	1931, 1932	10.25
21-31	182.60	.....	727.00	1934	0	1931	12.34
Month	207.20	1.5	839.00	1934	0	1931	11.91
Nov. 1-10	214.20	.....	515.00	1934	25.00	1935	14.47
11-20	677.50	.....	2,845.00	1934	0	1935	25.86
21-30	1,056.90	.....	2,682.00	1933	4.00	1931	46.36
Month	1,948.60	14.7	5,731.00	1934	31.00	1935	30.54
Dec. 1-10	149.45	.....	615.25	1932	0	1931	11.50
11-20	1.00	.....	4.00	1931	0	1932, 1933, 1935	.83
21-31	4.20	.....	19.00	1931	0	1933, 1934, 1935	4.20
Month	154.65	1.1	617.25	1932	6.00	1935	10.17
6 months	2,422.95	18.2	6,691.00	1934	127.00	1935	21.71
Year	13,284.95	100.0	19,772.50	1931	5,428.00	1935	32.02

TABLE 20.—Average, Maximum, and Minimum Cost of Suppression and Average Cost of Suppression per Fire

By months and 10-day periods for the 5 years 1931 to 1935

Period	Average		Maximum		Minimum		Cost per fire
	Cost, dollars	Per cent	Cost, dollars	Year	Cost, dollars	Year	
Jan. 1-10	7.23	.....	24.45	1933	0	1932, 1934	2.58
11-20	12.55	.....	41.54	1933	0	1932, 1935	3.30
21-31	61.74	.....	291.39	1931	0	1935	7.18
Month	81.52	3.9	309.27	1931	7.42	1935	5.36
Feb. 1-10	51.61	.....	243.60	1931	0	1933	5.87
11-20	6.29	.....	23.18	1932	0	1931	1.66
21-28	128.36	.....	285.72	1932	0	1934	5.63
Month	186.26	8.9	426.45	1931	5.29	1935	5.26
Mar. 1-10	25.01	.....	53.38	1933	0	1931, 1934	1.54
11-20	20.10	.....	61.33	1935	4.45	1931	1.86
21-31	32.02	.....	63.22	1932	4.65	1933	1.67
Month	77.13	3.7	118.24	1935	24.92	1931	1.67
Apr. 1-10	190.03	.....	439.61	1932	5.17	1935	4.34
11-20	395.74	.....	1,355.21	1931	24.19	1935	10.64
21-30	231.74	.....	545.80	1931	95.64	1934	4.31
Month	817.51	39.0	2,230.50	1931	133.38	1935	6.06
May 1-10	358.25	.....	1,071.30	1931	8.27	1935	9.28
11-20	91.71	.....	332.30	1932	1.77	1935	7.05
21-31	54.23	.....	239.71	1932	0	1933	4.84
Month	504.19	24.1	1,155.80	1931	16.53	1935	8.03
June 1-10	17.79	.....	76.79	1931	0	1933, 1935	5.56
11-20	12.73	.....	37.68	1931	0	1932, 1934, 1935	4.54
21-30	9.68	.....	26.51	1933	0	1935	3.23
Month	40.20	1.9	121.77	1931	0	1935	4.47
6 months	1,706.81	81.5	4,268.71	1931	280.86	1935	5.63
July 1-10	2.13	.....	4.49	1931	0	1932, 1935	2.13
11-20	13.53	.....	45.17	1931	0	1932, 1934, 1935	5.64
21-31	8.06	.....	18.40	1931	0	1935	4.03
Month	23.72	1.1	68.06	1931	0	1935	4.39
Aug. 1-10	.71	.....	3.55	1932	0	1931, 1933, 1934, 1935	.89
11-20	9.25	.....	44.95	1932	0	1931, 1934, 1935	5.78
21-31	1.18	.....	4.40	1933	0	1931, 1934, 1935	2.95
Month	11.14	.5	50.00	1932	0	1931, 1934, 1935	3.98
Sept. 1-10	6.09	.....	26.65	1932	0	1931, 1933, 1935	3.38
11-20	24.90	.....	121.85	1932	0	1931, 1933	4.98
21-30	.10	.....	.50	1931	0	1932, 1933, 1934, 1935	.50
Month	31.09	1.5	148.50	1932	0	1933	4.44
Oct. 1-10	.09	.....	.45	1932	0	1931, 1933, 1934, 1935	.45
11-20	3.05	.....	5.54	1934	0	1931	1.27
21-31	30.64	.....	99.63	1934	0	1931	2.07
Month	33.78	1.6	105.17	1934	0	1931	1.94
Nov. 1-10	43.34	.....	98.50	1931	7.35	1935	2.93
11-20	64.84	.....	178.79	1934	1.57	1935	2.47
21-30	89.57	.....	164.80	1932	1.96	1935	3.93
Month	197.75	9.5	346.16	1934	10.88	1935	3.10
Dec. 1-10	84.62	.....	413.15	1932	0	1931	6.51
11-20	.73	.....	2.95	1931	0	1932, 1933, 1934	.61
21-31	5.32	.....	22.70	1932	0	1933, 1935	5.33
Month	90.67	4.3	435.85	1932	2.73	1933	5.97
6 months	388.15	18.5	926.65	1932	29.52	1935	3.48
Year	2,094.96	100.0	4,466.27	1931	310.38	1935	5.06

TABLE 21.—Average, Maximum, and Minimum Cost of Suppression and Average Cost of Suppression per Fire

By months and 10-day periods for the 5 years 1926 to 1930

Period	Average		Maximum		Minimum		Cost per fire, dollars
	Cost, dollars	Per cent	Cost, dollars	Year	Cost, dollars	Year	
Jan. 1-10	11.68	.....	26.49	1930	2.00	1927	4.87
11-20	10.40	.....	52.00	1928	0	1926, 1927, 1929, 1930	4.33
21-31	14.12	.....	68.58	1928	0	1926, 1929, 1930	7.06
Month	36.20	0.8	133.53	1928	4.00	1927	5.32
Feb. 1-10	8.37	.....	36.16	1928	0	1926, 1929, 1930	4.19
11-20	46.10	.....	203.29	1930	0	1926, 1927, 1928	8.86
21-28	23.04	.....	84.67	1930	0	1927, 1929	7.20
Month	77.51	1.8	287.96	1930	5.70	1927	7.45
Mar. 1-10	39.10	.....	63.53	1928	13.80	1926, 1927	5.43
11-20	186.90	.....	403.65	1930	5.90	1926	7.92
21-31	207.71	.....	428.26	1929	20.50	1927	7.11
Month	433.71	10.0	830.94	1929	43.55	1926	7.23
Apr. 1-10	705.88	.....	1,623.70	1928	19.00	1927	15.76
11-20	592.71	.....	2,012.21	1930	14.78	1927	19.76
21-30	228.37	.....	439.52	1930	32.97	1927	9.06
Month	1,526.96	35.2	3,490.66	1930	66.75	1927	15.61
May 1-10	786.44	.....	2,444.23	1928	8.49	1927	18.46
11-20	66.78	.....	227.50	1928	0	1927, 1929, 1930	12.84
21-31	47.02	.....	93.86	1930	0	1927, 1929	8.71
Month	900.24	20.7	2,739.63	1928	8.49	1927	16.92
June 1-10	34.62	.....	115.41	1930	0	1926, 1927	7.53
11-20	24.66	.....	123.28	1930	0	1926, 1927, 1928, 1929	10.27
21-30	40.32	.....	199.59	1930	0	1926, 1928, 1929	13.44
Month	99.60	2.3	438.28	1930	0	1926	9.96
6 months	3,074.22	70.7	6,062.50	1930	168.57	1927	12.91
July 1-10	39.39	.....	196.95	1930	0	1926, 1927, 1928, 1929	11.58
11-20	157.16	.....	785.79	1930	0	1926, 1927, 1928, 1929	21.83
21-31	215.65	.....	1,063.18	1930	0	1927, 1928, 1929	23.96
Month	412.20	9.5	2,045.92	1930	0	1927, 1928, 1929	21.03
Aug. 1-10	147.55	.....	737.73	1930	0	1926, 1927, 1928, 1929	26.35
11-20	53.63	.....	266.69	1930	0	1926, 1928, 1929	12.19
21-31	1.65	.....	5.20	1928	0	1926, 1927, 1929	4.10
Month	202.83	4.7	1,007.42	1930	0	1926, 1929	19.50
Sept. 1-10	28.74	.....	127.72	1930	0	1926, 1927, 1928	7.98
11-20	6.03	.....	13.45	1928	0	1929	4.31
21-30	23.47	.....	114.83	1930	0	1926, 1928, 1929	6.52
Month	58.24	1.3	254.10	1930	3.14	1926	6.77
Oct. 1-10	30.48	.....	102.47	1928	0	1926	8.98
11-20	98.09	.....	253.36	1930	0	1926, 1927	15.82
21-31	156.68	.....	653.57	1927	0	1926	14.78
Month	285.25	6.6	662.97	1927	0	1926	14.12
Nov. 1-10	80.73	.....	186.62	1930	5.75	1926	8.41
11-20	119.45	.....	313.68	1927	0	1929	10.86
21-30	79.32	.....	246.32	1930	0	1926, 1929	8.81
Month	279.50	6.4	535.67	1927	23.42	1929	9.44
Dec. 1-10	12.65	.....	24.66	1928	1.00	1930	4.22
11-20	7.19	.....	19.39	1928	0	1927, 1929	4.49
21-31	14.57	.....	42.27	1928	0	1926, 1929	8.10
Month	34.41	.8	86.32	1928	4.00	1929	5.38
6 months	1,272.43	29.3	4,206.59	1930	97.97	1929	13.42
Year	4,346.65	100.0	10,269.09	1930	1,245.37	1926	13.05

TABLE 22.—General Forest Fire Statistics

By months and 10-day periods for the year 1930

(The year with one continuous fire season)

Period	Number of fires	Per cent	Woods area burned		Size of average fire, acres	Damage to woods, dollars	Cost of suppression, dollars
			Acres	Per cent			
Jan. 1-10	5	.....	23.0	.....	4.6	23.00	26.49
11-20	.....	.....	.....	.....	.....	.....	.....
21-31	.....	.....	.....	.....	.....	.....	.....
Month	5	0.8	23.0	0.1	4.6	23.00	26.49
Feb. 1-10	1	.....	.....	.....	.....	.....	.....
11-20	19	.....	599.0	.....	31.5	1,047.50	203.29
21-28	11	.....	86.0	.....	7.8	305.00	84.67
Month	31	4.6	685.0	3.9	22.1	1,352.50	287.96
Mar. 1-10	6	.....	45.5	.....	7.6	81.00	43.30
11-20	38	.....	817.0	.....	21.5	1,830.00	403.65
21-31	40	.....	578.5	.....	14.5	943.00	294.56
Month	84	12.5	1,441.0	8.2	17.2	2,854.00	741.51
Apr. 1-10	53	.....	1,922.1	.....	36.3	5,592.00	1,038.93
11-20	73	.....	5,484.1	.....	75.1	17,084.00	2,012.21
21-30	38	.....	754.5	.....	19.9	2,046.00	439.52
Month	164	24.4	8,160.7	46.2	49.8	24,722.00	3,490.66
May 1-10	60	.....	1,903.5	.....	31.7	7,020.00	983.74
11-20	.....	.....	.....	.....	.....	.....	.....
21-31	12	.....	103.7	.....	8.6	307.00	93.86
Month	72	10.7	2,007.2	11.3	27.9	7,327.00	1,077.60
June 1-10	18	.....	185.0	.....	10.3	416.00	115.41
11-20	12	.....	317.0	.....	26.4	796.00	123.28
21-30	14	.....	183.0	.....	13.1	687.00	199.59
Month	44	6.6	685.0	3.9	15.6	1,899.00	438.28
6 months	400	59.6	13,001.9	73.6	32.5	38,177.50	6,062.50
July 1-10	17	.....	181.1	.....	10.6	742.00	196.95
11-20	36	.....	636.1	.....	17.7	2,033.00	785.79
21-31	44	.....	1,190.6	.....	27.1	3,376.50	1,063.18
Month	97	14.5	2,007.8	11.3	20.7	6,151.50	2,045.92
Aug. 1-10	28	.....	1,103.1	.....	39.4	2,612.00	737.73
11-20	21	.....	188.3	.....	9.0	546.50	266.69
21-31	1	.....	.5	.....	.5	1.50	3.00
Month	50	7.4	1,291.9	7.3	25.8	3,160.00	1,007.42
Sept. 1-10	16	.....	82.0	.....	5.1	163.50	127.72
11-20	3	.....	8.0	.....	2.7	12.00	11.55
21-30	17	.....	108.6	.....	6.4	300.50	114.83
Month	36	5.3	198.6	1.1	5.5	476.00	254.10
Oct. 1-10	5	.....	28.0	.....	5.6	61.00	36.55
11-20	15	.....	171.5	.....	11.4	363.00	253.36
21-31	7	.....	84.4	.....	12.1	178.00	44.55
Month	27	4.0	283.9	1.6	10.5	602.00	334.46
Nov. 1-10	20	.....	204.4	.....	10.2	349.50	186.62
11-20	12	.....	98.2	.....	8.2	186.00	101.95
21-30	23	.....	542.0	.....	23.6	750.50	246.32
Month	55	8.3	844.6	4.8	15.4	1,286.00	534.89
Dec. 1-10	2	.....	3.0	.....	1.5	3.00	1.00
11-20	1	.....	.5	.....	.5	0	2.50
21-31	3	.....	47.5	.....	15.8	69.00	26.30
Month	6	.9	51.0	.3	8.5	72.00	29.80
6 months	271	40.4	4,677.8	26.4	17.3	11,747.50	4,206.59
Year	671	100.0	17,679.7	100.0	26.3	49,925.00	10,269.09

On account of the low State expenditures for suppression, due to lack of funds and the availability of the CCC labor for fire suppression during 1933, 1934, and 1935, Table 21 was prepared to give the cost of suppression data by 10-day periods for 1926 to 1930. During this period the cost of suppression figures are more significant and reliable for administrative planning and budgeting.

CAUSES OF FIRES

Information as to the causes of fires in the Ohio Fire District is given in considerable detail in Table 23, "Average annual number of fires, woods area burned, damage, and cost of suppression, by causes, for the 10-year period 1926 to 1935". The burning of brush and debris is the occasion for the escape of nearly one fire out of four, and is the leading cause in point of number of fires. However, a much greater burned area is due to fires of supposed incendiary origin, and this cause alone accounts for about 35 per cent of the entire woods area burned. These points concerning debris burning and incendiary fires are further emphasized in Figures 12 and 13.

TABLE 23.—Average Annual Number of Fires, Woods Area Burned, Damage, and Cost of Suppression

By causes for the 10-year period 1926 to 1935

Cause	Number of fires		Woods area burned		Per cent of fires over 10 acres	Size of average fire, woods acres	Damage to woods		Cost of suppression	
	Average	Per cent	Acres	Per cent			Dollars	Per cent	Dollars	Per cent
Lightning...	0.8	0.2	8.2	0.1	37.5	10.25	21.00	0.1	8.01	0.2
Railroads....	30.8	8.2	215.9	2.6	38.6	7.00	556.68	3.0	139.55	4.3
Campfires...	16.4	4.4	463.9	5.6	48.8	28.28	1,019.50	5.4	158.21	4.9
Smokers.....	64.9	17.4	953.4	11.6	41.0	14.69	2,061.10	11.0	476.52	14.8
Debris burning.....	91.3	24.4	1,466.2	17.8	49.4	16.05	3,695.15	19.7	684.12	21.3
Incendiary..	81.7	21.8	2,849.4	34.7	55.3	34.87	6,169.22	32.9	961.58	29.9
Lumbering..	3.6	1.0	82.3	1.0	55.6	22.86	223.70	1.2	55.77	1.7
Miscellaneous	29.7	8.0	491.6	6.0	40.4	16.55	1,046.50	5.6	270.50	8.4
Unknown....	54.7	14.6	1,691.7	20.6	60.7	30.92	3,949.80	21.1	466.54	14.5
Total.....	373.9	100.0	8,223.5	100.0	49.3	21.99	18,742.65	100.0	3,220.80	100.0

In the column "Size of the average fire, woods acres" in Table 23, it is seen that lightning fires are very small, doubtless because they start in the summer when the rate of spread is low. There is less than one lightning fire a year. Ninety-eight and eight-tenths per cent of all fires are due to the other causes and, being man-caused, are also preventable.

Railroad fires are usually readily accessible, are often fought by section crews, and for these reasons average smaller in size than the fires due to other causes.

Unextinguished campfires are often left in out-of-the-way places, and the guilty parties are usually miles away by the time the fire escapes. Most such fires are left in the night and blow out from the embers the following day when the wind rises. Fires from this source are the easiest to prevent of any of the fires on the part of the persons responsible, excepting the smoker fires. They

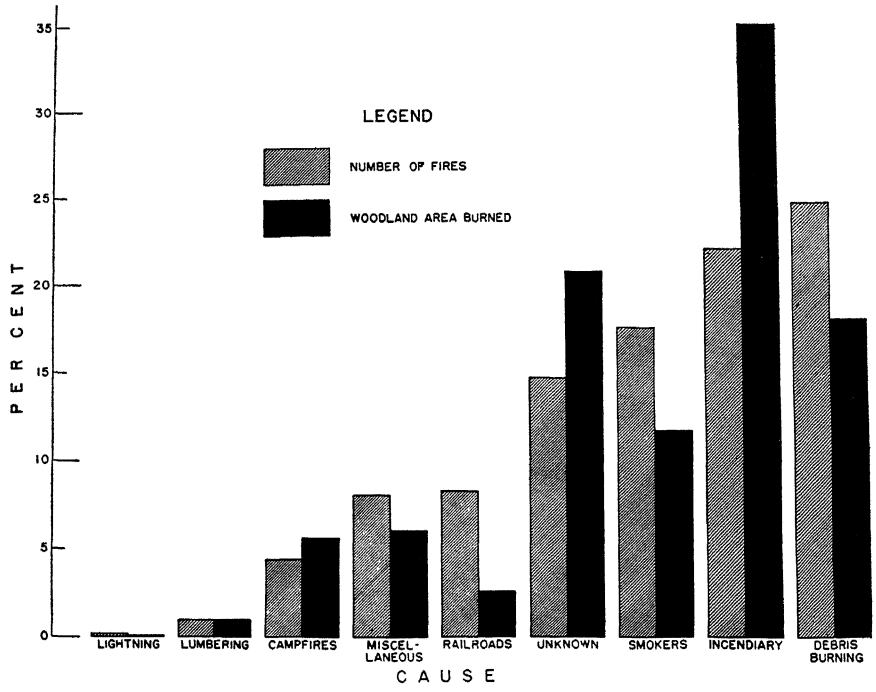

Fig. 12.—Per cent of number of fires and woodland area burned per year by causes, 1926 to 1935

are, however, often the most difficult to extinguish because they escape when the burning conditions are worst, from 9:00 a. m. to 2:00 p. m. For this reason, campfire fires average nearly as large as the incendiary fires. Smoker fires average very small, apparently because set in accessible places along roads and paths. Debris burner fires also average rather small because the persons responsible for their escape are usually early on the scene attempting to stop their spread. They also originate in relatively accessible places, so that the suppression forces consume little time in arriving at the scene.

With the incendiary fires, the case is quite different. The incendiary selects an inaccessible situation and usually starts the fire in more than one place, where there is an abundance of fuel, and at a time when the fire will travel fast. For these reasons the incendiary fires are the largest of all; their area and damage figures far exceed those of any other cause.

Lumbering fires usually escape because of the lack of a spark arrester on the stack of a wood-burning boiler, or because of the burning of sawmill waste. They can very easily be prevented by the removal of leaves and other inflammables surrounding the mill set. This work can most easily be accomplished before the mill is moved in, by raking a safety strip and then burning off the leaf litter on an acre or so of ground. This, incidentally, is good fire insurance for the mill, lumber piles, and other equipment, as well as for the surrounding woodlands. Lumbering fires have, however, diminished in importance until they account for but 1 per cent of the total area burned.

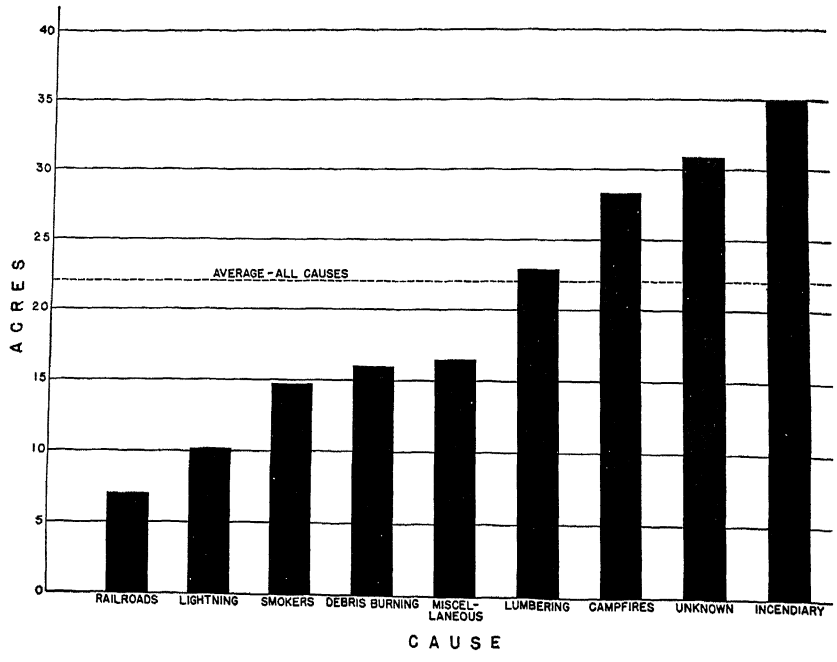

Fig. 13.—Size of the average fire (woods area only) by causes, 1926 to 1935

Under "miscellaneous" are grouped a large number of minor causes, some of which are freak causes and very unusual. Among them are to be found fires caused by burning buildings, burning automobiles, sparks from chimneys, illicit liquor operations, hollow trees fired by hunters, spontaneous combustion of coal slack dumps, persons getting their clothes on fire, and other such freak situations. Together, all such causes account for 6 per cent of the total woods area burned.

A large number of fires of undetermined origin are grouped together under the caption "unknown". It should be a permanent policy to attempt to fix a probable cause for every fire by process of elimination where direct evidence is lacking. But there will always be fires whose cause is so much in doubt as to render their classification quite meaningless. The best way to reduce the number of fires classified as "unknown" is to lower discovery and travel time. The sooner a fire is reached the better opportunity there is to determine its cause correctly.

The percentage figures under the columns "Woods area burned", "Damage to woods", and "Cost of suppression" are, as might be expected, closely parallel for each of the respective causes.

Table 24 analyzes fires by cause, based on number and per cent of number of fires according to short 3- and 5-year periods.

TABLE 24.—Average Annual Number and Per Cent of Total Number of Fires
By causes by 3-year, 5-year, and 10-year periods, 1923 to 1935

Cause	Average number of fires				Per cent of total number			
	1923-1925	1926-1930	1931-1935	1926-1935	1923-1925	1926-1930	1931-1935	1926-1935
Lightning	0.3	0.6	1.0	0.8	0.2	0.2	0.2	0.2
Railroads	26.3	41.8	19.8	30.8	17.3	12.6	4.8	8.2
Campfires	11.0	14.6	18.2	16.4	7.2	4.4	4.4	4.4
Smokers	10.0	57.6	72.2	64.9	6.6	17.3	17.4	17.4
Debris burning	37.3	78.0	104.6	91.3	24.4	23.4	25.2	24.4
Incendiary	18.7	53.8	109.6	81.7	12.2	16.1	26.4	21.8
Lumbering	.7	4.6	2.6	3.6	.4	1.4	.6	1.0
Miscellaneous	8.7	28.6	30.8	29.7	5.7	8.6	7.5	8.0
Unknown	39.7	53.4	56.0	54.7	26.0	16.0	13.5	14.6
Total	152.7	333.0	414.8	373.9	100.0	100.0	100.0	100.0

Table 25 breaks up the 5-year periods into individual years, and is of value to show the trend of each cause up or down from year to year, based on number.

Tables 26, 27, and 28 classify in a similar manner the woods area burned, the woods damage, and the cost of suppression.

In order to prevent fires successfully, we must know what is causing them and be able to localize this information in point of time and place. Tables 29, 30, 31, 32, 33, and 34 attempt to do this by the arrangement of number, area, damage, and cost data for each cause according to county.

Tabular information is of considerable use in connection with general education and prevention work, but it is not nearly as enlightening as are the occurrence or "spot" maps which have been arranged according to cause and are published herewith. Information as to cause and exact location of every fire has been assiduously sought ever since 1927. From this information the spot maps have been derived. It is believed that the information contained in the spot maps is the most valuable data which this publication has to offer. It is now possible with the help of the spot maps to determine risk zones, and when these are definitely known, efforts can be intelligently directed to the application of appropriate remedial measures.

General zones of high risk due to combinations of causes may be readily outlined on Figure 4, which shows the location of the fires of all causes for the year 1934. Particularly important zones appear in southwestern Scioto County and the adjacent part of Adams County; in Scioto County east of the Scioto River and north of Portsmouth; adjacent to Ironton; southwest of Oak Hill; and southeast of McArthur. By referring to Figure 17 it may be seen that the risk zone in southwestern Scioto County and extending across the Adams County line is one of four very heavy incendiary zones. The prevailing cause of each of the other heavy risk zones may be determined in similar manner by referring to the other maps.

TABLE 25.—Per Cent of Number of Fires Due to Different Causes

By years and periods, 1926 to 1935

Cause	1926	1927	1928	1929	1930	5-year average	1931	1932	1933	1934	1935	5-year average	10-year average
Lightning	.....	.....	.....	.....	0.4	0.2	0.9	.....	.....	0.3	.....	0.3	0.2
Railroads	12.2	20.3	18.1	11.0	7.9	12.5	2.7	5.3	3.5	5.3	6.5	4.8	8.2
Campfires	9.6	5.1	3.9	2.8	4.3	4.4	4.3	4.2	5.4	2.9	7.6	4.4	4.4
Smokers	6.9	26.1	12.0	15.6	21.6	17.3	19.2	20.8	15.0	15.3	17.6	17.4	17.4
Debris burning	27.0	13.0	28.1	30.8	18.6	23.4	31.1	21.5	24.5	22.9	30.9	25.2	24.4
Incendiary	10.4	17.4	10.5	20.2	19.1	16.1	22.0	31.1	26.8	28.4	18.7	26.4	21.8
Lumbering	2.6	2.2	2.0	.4	1.1	1.4	.....	.4	.6	1.1	.3	.6	1.0
Miscellaneous	7.8	13.7	7.8	5.0	9.7	8.6	8.2	10.1	8.6	5.5	5.8	7.4	8.0
Unknown	23.5	2.2	17.6	14.2	17.3	16.1	11.6	6.6	15.6	18.3	12.6	13.5	14.6
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

TABLE 26.—Per Cent of Woods Area Burned Due to Different Causes

By years and periods, 1926 to 1935

Cause	1926	1927	1928	1929	1930	5-year average	1931	1932	1933	1934	1935	5-year average	10-year average
Lightning	.....	.....	.....	.....	0.3	0.1	0.2	.....	.....	0.1	.....	0.1	0.1
Railroads	4.9	6.3	5.4	5.9	1.6	3.9	.6	0.8	0.6	2.4	2.9	1.4	2.6
Campfires	14.0	4.1	5.5	3.1	4.8	5.4	6.8	5.7	9.7	2.6	7.3	5.9	5.6
Smokers	1.3	17.3	9.3	20.0	13.3	12.4	7.9	15.1	11.7	9.0	13.5	10.8	11.6
Debris burning	11.7	12.3	31.2	34.2	11.8	21.0	12.8	13.9	9.6	14.7	30.1	14.5	17.8
Incendiary	14.1	47.5	15.9	14.3	41.6	28.1	45.5	47.3	41.3	39.1	23.3	41.3	34.7
Lumbering	2.0	.9	2.8	.9	1.2	1.7	.....	.....	1.2	.4	.1	.3	1.0
Miscellaneous	3.7	10.2	5.8	1.7	6.9	5.8	6.9	10.7	3.9	5.2	2.1	6.2	6.0
Unknown	48.3	1.4	24.1	19.9	18.5	21.6	19.3	6.5	22.0	26.5	20.7	19.5	20.6
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

TABLE 27.—Per Cent of Damage to Woods Due to Different Causes

By years and periods, 1926 to 1935

Cause	1926	1927	1928	1929	1930	5-year average	1931	1932	1933	1934	1935	5-year average	10-year average
Lightning	.....	.....	.....	.....	0.3	0.1	0.3	.....	.....	0.1	.....	0.1	0.1
Railroads	2.8	6.9	6.0	5.4	1.2	3.8	.6	0.8	0.4	3.1	2.7	1.5	3.0
Campfires	17.6	3.4	5.6	2.6	4.2	5.3	4.4	7.4	11.9	2.7	6.3	5.7	5.4
Smokers	1.8	15.6	7.4	20.5	11.2	10.6	6.8	16.7	16.8	10.6	13.0	11.7	11.0
Debris burning	11.5	12.1	33.5	32.9	10.0	21.5	15.7	16.5	9.5	15.8	34.3	16.5	19.7
Incendiary	17.7	50.5	12.4	17.5	46.0	28.7	50.7	44.6	32.6	35.3	27.0	40.5	32.9
Lumbering	2.4	.8	1.4	.6	2.4	1.7	.....	.1	.5	.3	.1	.2	1.2
Miscellaneous	4.3	9.8	5.5	1.2	6.7	5.6	7.7	7.8	3.5	4.5	1.1	5.6	5.6
Unknown	41.9	.9	28.2	19.3	18.0	22.7	13.8	6.1	24.8	27.6	15.5	18.2	21.1
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

TABLE 28.—Per Cent of Cost of Suppression Due to Different Causes

By years and periods, 1926 to 1935

Cause	1926	1927	1928	1929	1930	5-year average	1931	1932	1933	1934	1935	5-year average	10-year average
Lightning	.....	.....	.....	.....	0.6	0.3	0.3	.....	.....	.....	.....	0.1	0.2
Railroads	2.7	7.6	8.8	5.4	3.2	5.3	1.8	1.5	1.2	8.5	3.3	2.3	4.3
Campfires	15.6	1.8	6.2	2.9	4.7	5.3	3.2	4.4	7.2	1.9	8.8	4.1	4.9
Smokers	6.8	20.3	8.9	22.4	17.8	15.4	10.1	18.4	12.4	14.0	11.7	13.7	14.8
Debris burning	28.8	10.7	32.1	27.2	15.8	22.2	21.5	15.8	16.9	18.3	35.4	19.2	21.3
Incendiary	15.2	41.6	14.5	19.8	30.1	24.3	44.9	44.1	37.5	25.5	24.9	41.4	29.9
Lumbering	2.5	1.2	3.9	1.8	1.9	2.4	.....	.1	1.4	.3	1.7	.3	1.7
Miscellaneous	8.9	15.2	5.8	3.6	10.6	8.6	5.8	11.4	5.5	9.1	2.3	7.9	8.4
Unknown	19.5	1.6	19.8	16.9	15.3	16.2	12.4	4.3	17.9	22.4	11.9	11.0	14.5
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

TABLE 29.—Per Cent of Number of Fires in Each County Due to Different Causes

For the 10-year period 1926 to 1935

Cause	Adams	Scioto	Law-rence	Gallia	Total Division 1	High-land	Pike	Jackson	Ross	Vinton	Athens	Hocking	Fair-field	Total Division 2	Total Fire District
Lightning	0.8	0.1	.....	.....	0.1	.....	0.8	0.3	.....	0.2	.....	0.5	.....	0.3	0.2
Railroads	1.7	4.4	1.7	.....	3.1	.....	5.4	9.3	8.3	26.1	34.0	.5	.....	14.2	8.2
Campfires	3.8	6.6	5.2	3.3	5.8	.....	1.7	4.2	2.4	2.6	2.0	2.8	5.9	2.8	4.4
Smokers	13.4	19.3	20.1	13.3	18.7	30.0	17.0	18.3	16.6	13.2	12.0	14.9	35.3	15.8	17.4
Debris burning	30.1	28.2	14.4	30.0	24.0	40.0	31.6	24.2	35.2	16.4	18.0	31.5	41.2	24.9	24.4
Incendiary	29.3	21.6	30.8	16.7	25.5	10.0	9.1	18.6	13.4	23.3	6.0	18.8	.....	17.6	21.8
Lumbering	.4	.9	.6	.....	.7	.....	.4	1.7	.4	.8	6.0	2.8	.....	1.2	1.0
Miscellaneous	7.9	10.1	7.6	13.3	9.1	.....	12.0	5.1	10.7	4.1	8.0	4.4	17.6	6.6	8.0
Unknown	12.6	8.8	19.6	23.4	13.0	20.0	22.0	18.3	13.0	13.3	14.0	23.8	.....	16.6	14.6
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

TABLE 30.—Per Cent of Number of Fires in the Fire District Due to Different Causes

For the 10-year period 1926 to 1935

Cause	Adams	Scioto	Law-rence	Gallia	Total Division 1	High-land	Pike	Jackson	Ross	Vinton	Athens	Hocking	Fair-field	Total Division 2	Total Fire District
Lightning	25.0	12.5	.....	.....	37.5	.....	5.0	12.5	.....	12.5	.....	12.5	.....	62.5	100.0
Railroads	1.3	15.6	3.6	.....	20.5	.....	4.2	10.7	6.8	52.0	5.5	.3	.....	79.5	100.0
Campfires	5.5	43.9	20.8	0.6	70.8	.....	2.4	9.1	3.7	9.8	.6	3.0	0.6	29.2	100.0
Smokers	4.9	32.4	20.3	.6	58.2	0.5	6.3	10.0	6.5	12.5	.9	4.2	.9	41.8	100.0
Debris burning	7.9	33.7	10.4	1.0	53.0	.4	8.3	9.4	9.7	11.1	1.0	6.3	.8	47.0	100.0
Incendiary	8.6	28.9	24.8	.6	62.9	.1	2.7	8.1	4.2	17.5	.4	4.1	.....	37.1	100.0
Lumbering	2.8	27.8	11.1	.....	41.7	.....	2.8	16.6	2.8	13.9	8.3	13.9	.....	58.3	100.0
Miscellaneous	6.4	37.1	16.8	1.3	61.6	.....	9.8	6.1	9.1	8.4	1.3	2.7	1.0	38.4	100.0
Unknown	5.5	17.5	23.6	1.3	47.9	.4	9.7	11.9	6.0	15.0	1.3	7.8	.....	52.1	100.0
Total	6.4	29.2	17.6	.8	54.0	.3	6.4	9.5	6.8	16.4	1.3	4.8	.5	46.0	100.0

TABLE 31.—Per Cent of Woods Area Burned in Each County Due to Different Causes

For the 10-year period 1926 to 1935

Cause	Adams	Scioto	Lawrence	Gallia	Division 1	Highland	Pike	Jackson	Ross	Vinton	Athens	Hocking	Fairfield	Division 2	Fire District
Lightning	.....	0.2	.....	.....	0.1	.....	0.2	.....	.....	0.2	.....	0.4	.....	0.1	0.1
Railroads	0.8	1.1	0.8	.....	.9	.....	.8	7.8	6.4	4.7	30.8	.....	.....	5.1	2.6
Campfires	7.9	7.0	10.1	.....	8.1	.....	.6	1.5	3.6	2.4	4.5	3.2	0.1	2.1	5.6
Smokers	5.8	9.4	11.7	4.3	9.6	9.0	9.9	12.6	17.1	16.8	33.8	6.8	27.6	14.4	11.6
Debris burning	12.5	26.8	8.8	11.2	17.5	77.3	29.1	17.8	28.0	9.6	13.1	18.1	61.2	18.3	17.8
Incendiary	63.9	38.4	32.5	7.3	38.5	5.7	20.2	22.4	18.6	43.5	2.3	22.9	.....	29.1	34.7
Lumbering	.8	.6	.4	.....	.6	.....	1.3	1.4	.5	.9	.9	9.1	.....	1.7	1.0
Miscellaneous	1.7	9.1	6.2	33.8	7.8	.....	5.3	2.2	9.4	1.8	2.3	1.2	11.1	3.4	6.0
Unknown	6.6	7.4	29.5	43.4	16.9	8.0	32.6	34.3	16.4	20.1	12.3	38.3	.....	25.8	20.6
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

TABLE 32.—Per Cent of Woods Area Burned in the Fire District Due to Different Causes

By counties for the 10-year period 1926 to 1935

Cause	Adams	Scioto	Lawrence	Gallia	Division 1	Highland	Pike	Jackson	Ross	Vinton	Athens	Hocking	Fairfield	Division 2	Fire District
Lightning	0.2	42.6	.....	.....	42.8	.....	12.2	.....	.....	30.4	.....	14.6	.....	57.2	100.0
Railroads	2.4	11.3	6.4	.....	20.1	.....	2.3	24.8	11.3	28.7	12.8	.....	.....	79.9	100.0
Campfires	11.0	33.3	40.3	.....	84.6	.....	.8	2.2	2.9	6.7	.9	1.9	.....	15.4	100.0
Smokers	3.9	21.5	22.7	0.7	48.8	0.2	6.2	9.1	6.8	23.1	3.2	2.0	0.6	51.2	100.0
Debris burning	5.5	40.1	11.0	1.2	57.8	1.1	11.8	8.3	7.2	8.7	.8	3.4	.9	42.2	100.0
Incendiary	14.5	29.6	21.0	.4	65.5	0	4.2	5.4	2.5	20.1	.1	2.2	.....	34.5	100.0
Lumbering	6.0	17.0	9.7	.....	32.7	.....	9.0	11.4	2.4	13.7	1.0	29.8	.....	67.3	100.0
Miscellaneous	2.2	40.6	23.4	10.8	77.0	.....	6.4	3.0	7.2	4.8	.4	.7	.5	23.0	100.0
Unknown	2.5	9.7	32.2	4.0	48.4	.1	11.4	13.9	3.7	15.7	.6	6.2	.....	51.6	100.0
Total	7.9	26.7	22.4	1.9	58.9	.3	7.2	8.3	4.6	16.0	1.1	3.3	.3	41.1	100.0

TABLE 33.—Per Cent of Woods Damage in Each County Due to Different Causes

For the 10-year period 1926 to 1935

Cause	Adams	Scioto	Lawrence	Gallia	Division 1	High-land	Pike	Jackson	Ross	Vinton	Athens	Hocking	Fairfield	Division 2	Fire District
Lightning	.....	0.2	.....	.....	0.1	.....	0.1	.....	.....	0.2	.....	0.5	.....	0.1	0.1
Railroads	0.6	.7	1.2	.....	.9	.....	.6	7.8	11.5	4.7	34.2	.....	.....	5.9	3.0
Campfires	11.2	6.6	8.4	.....	7.7	.....	.4	1.3	3.8	2.9	1.2	4.8	.....	2.2	5.4
Smokers	4.9	8.4	11.1	6.8	8.7	6.0	9.7	8.8	17.9	18.7	31.7	7.5	54.1	14.2	11.0
Debris burning	10.8	27.1	12.3	16.5	19.4	73.7	34.1	18.0	30.5	9.9	16.0	19.1	32.0	20.1	19.7
Incendiary	65.9	38.1	29.1	9.6	38.6	3.1	21.9	17.4	12.5	40.3	1.2	22.8	.....	25.0	32.9
Lumbering	.6	.7	.5	.....	.6	.....	.2	4.2	2.1	1.3	.9	2.8	.....	2.0	1.2
Miscellaneous	1.1	8.8	7.1	37.7	7.8	.....	4.8	1.0	5.8	1.4	1.8	1.2	13.9	2.6	5.6
Unknown	4.9	9.4	30.3	29.4	16.2	17.2	28.2	41.5	15.9	20.6	13.0	41.3	.....	27.9	21.1
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

TABLE 34.—Per Cent of Cost of Suppression in Each County Due to Different Causes

For the 10-year period 1926 to 1935

Cause	Adams	Scioto	Law-rence	Gallia	Division 1	High-land	Pike	Jackson	Ross	Vinton	Athens	Hocking	Fair-field	Division 2	Fire District
Lightning	0.3	0.3	.....	.....	0.2	.....	0.6	.....	.....	0.1	.....	1.2	.....	0.3	0.2
Railroads	.3	2.3	1.7	.....	1.8	.....	2.1	9.0	7.3	13.4	28.3	.....	.....	8.1	4.3
Campfires	7.6	5.1	8.1	1.1	6.2	.....	1.6	5.7	2.3	2.6	.2	5.6	2.3	3.1	4.9
Smokers	7.6	10.9	21.2	6.2	12.9	28.3	17.1	17.7	18.9	18.2	11.0	14.4	15.5	17.5	14.8
Debris burning	21.0	25.7	10.8	18.3	21.2	31.0	30.4	20.5	25.2	11.0	17.5	19.2	78.6	21.3	21.3
Incendiary	47.6	36.9	31.8	13.4	36.8	5.7	21.3	13.1	13.5	27.8	2.2	22.8	.....	19.6	29.9
Lumbering	1.6	.7	1.2	.....	1.0	.....	.3	2.1	.6	3.1	9.5	13.5	.....	2.9	1.7
Miscellaneous	5.3	12.3	7.6	44.9	10.6	.....	7.5	4.8	5.2	4.1	5.3	4.8	3.6	5.2	8.4
Unknown	8.7	5.8	17.6	16.1	9.3	35.0	19.1	27.1	27.0	19.7	26.0	18.5	.....	22.0	14.5
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Figure 14 shows the location of fires escaping from campfires during the 5 years 1931 to 1935. Although the small number shows this to be a relatively minor cause, the definite zoning strongly suggests that remedial measures be applied at the places indicated.

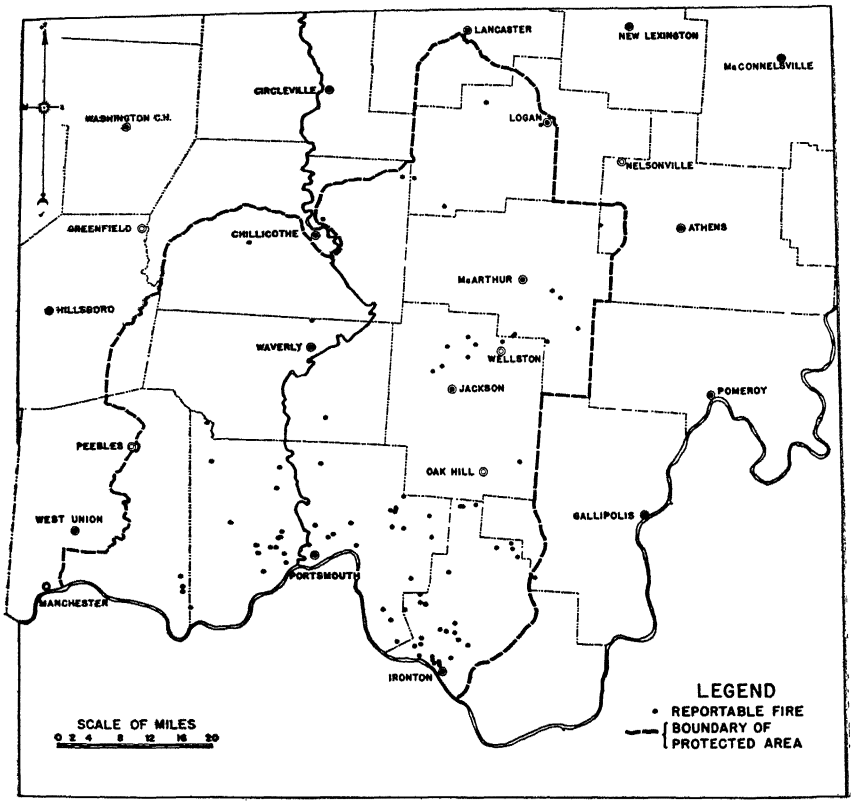

Fig. 14.—Location of all fires caused by campfires, 1931 to 1935

Figure 15 is the spot map of smoker fires. Many of these are due to fall hunting. The cause is one of considerable importance, but the zoning less strong than for any other cause excepting debris burning. It therefore appears that both for smoker and debris burning fires (see Figure 16) a widespread educational campaign is in order.

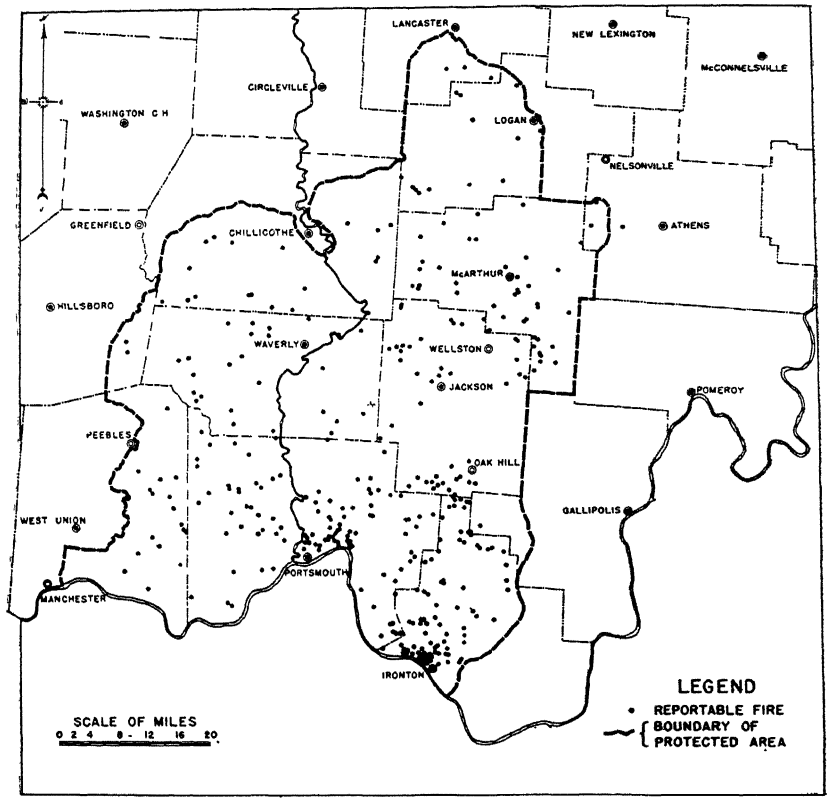

Fig. 15.—Location of all fires caused by smokers, 1931 to 1935

It should be said that although for purposes of this publication the spot maps have been prepared by 5-year periods, in the Division office at Chillicothe they are prepared by 6-month periods. These maps show that debris burning fires occur principally in the spring; whereas most smoker fires occur in the fall (from hunters). Debris burning fires escape from control principally for the following reasons: Burning is done during the heat of the day. Burning is done without first preparing a surrounding raked path or plowed strip. Fire is allowed to run uphill or with the wind. Embers are not extinguished and fire escapes the next day. Fire is left unattended. Since most debris burners do not wish their fires to escape, this cause should yield to educational measures.

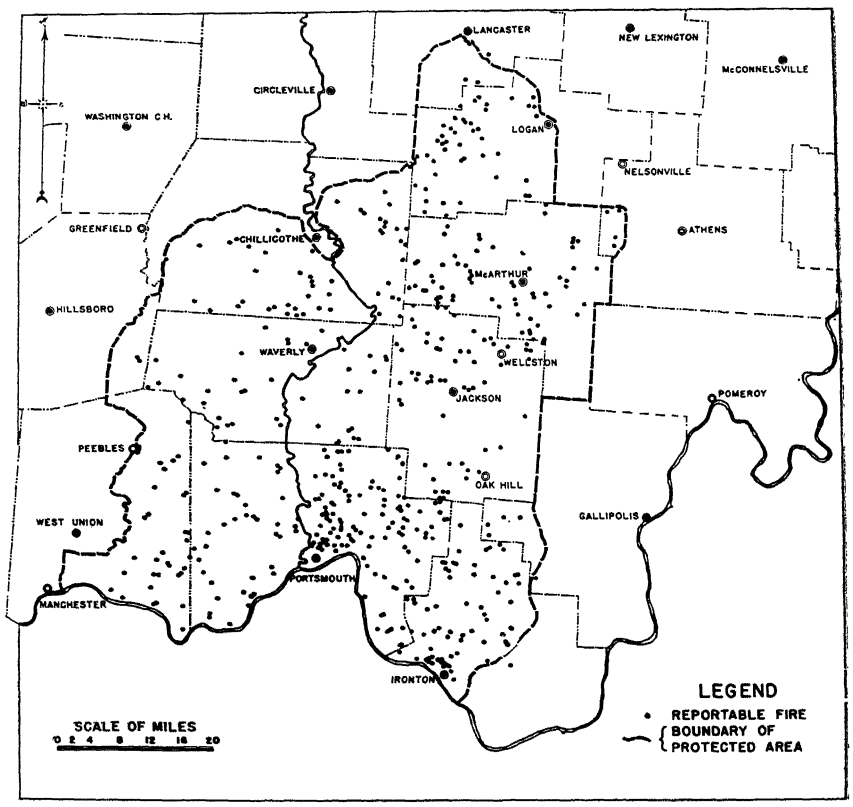

Fig. 16.—Location of all fires caused by debris burning, 1931 to 1935

Figure 17 indicates very clearly four major incendiary zones and several minor ones. The minor zones should not be neglected in favor of the major ones, as these small zones sometimes show a tendency to extend and become more serious. No cause is more important nor harder to combat than this one. Because of the great difficulty in obtaining evidence against the party responsible, preventive measures must often be indirect. Speedy suppression of the fires and efforts to obtain local cooperation and good will are likely to obtain results where evidence is lacking for a prosecution.

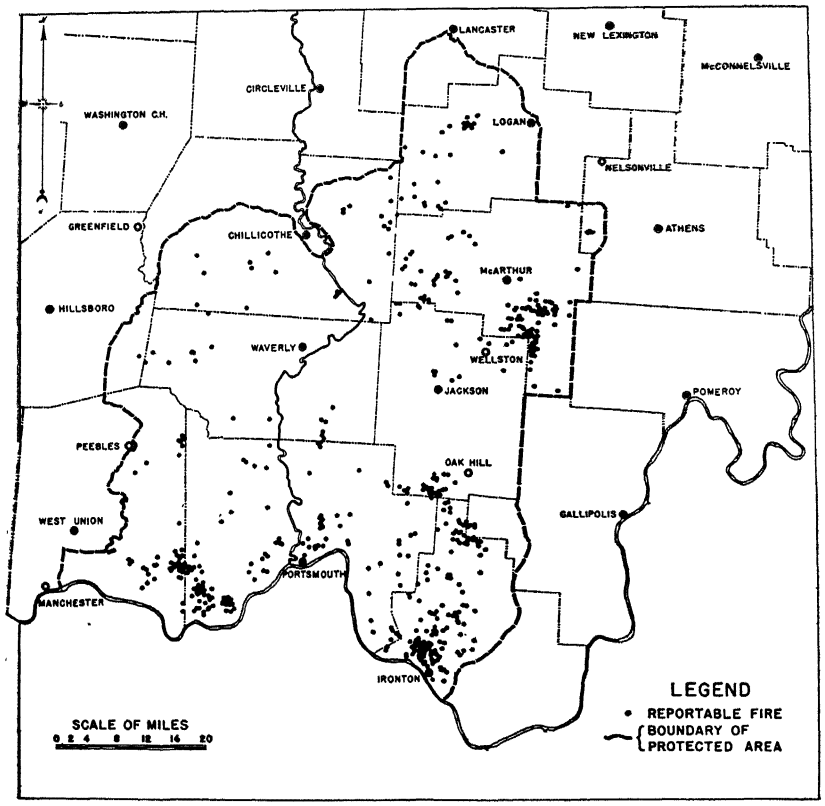

Fig. 17.—Location of all fires of supposed incendiary origin, 1931 to 1935

Figure 18 shows fires of "miscellaneous" origin to be widely scattered. Efforts for their prevention cannot, therefore, be strongly localized.

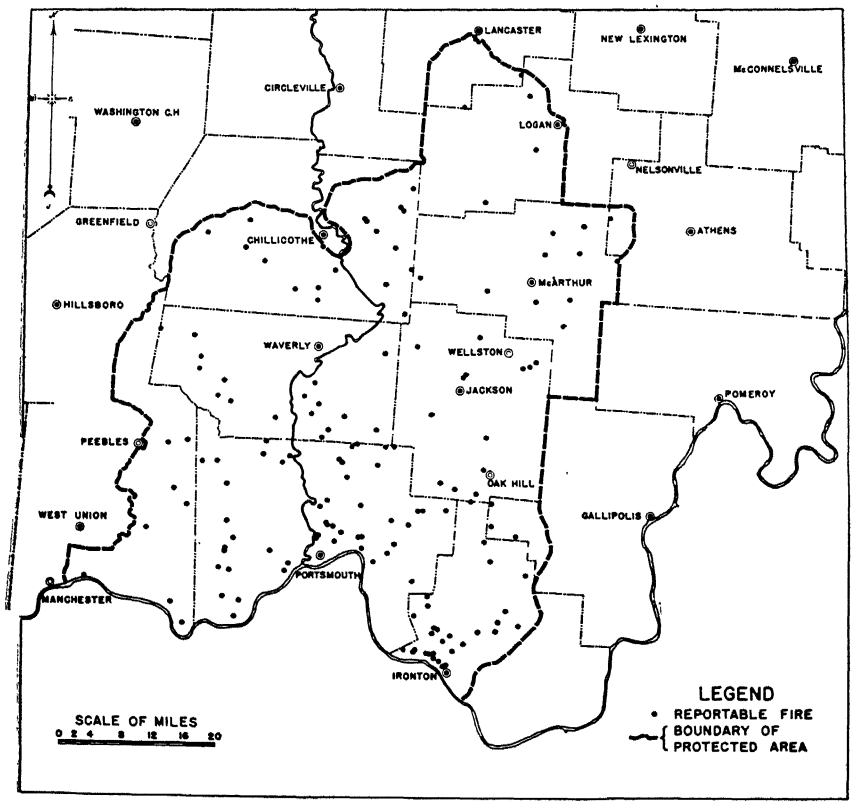

Fig. 18.—Location of all fires due to miscellaneous known causes, 1931 to 1935

Figure 19, showing railroad fires, naturally indicates a very pronounced zoning at danger points along the railroads that pass through the Fire District. Efforts should be made to obtain the cooperation of railroad officials and section crews to keep their right of ways free from inflammable material, particularly at known danger points. Danger points which have not been kept free from inflammables are well indicated on this map.

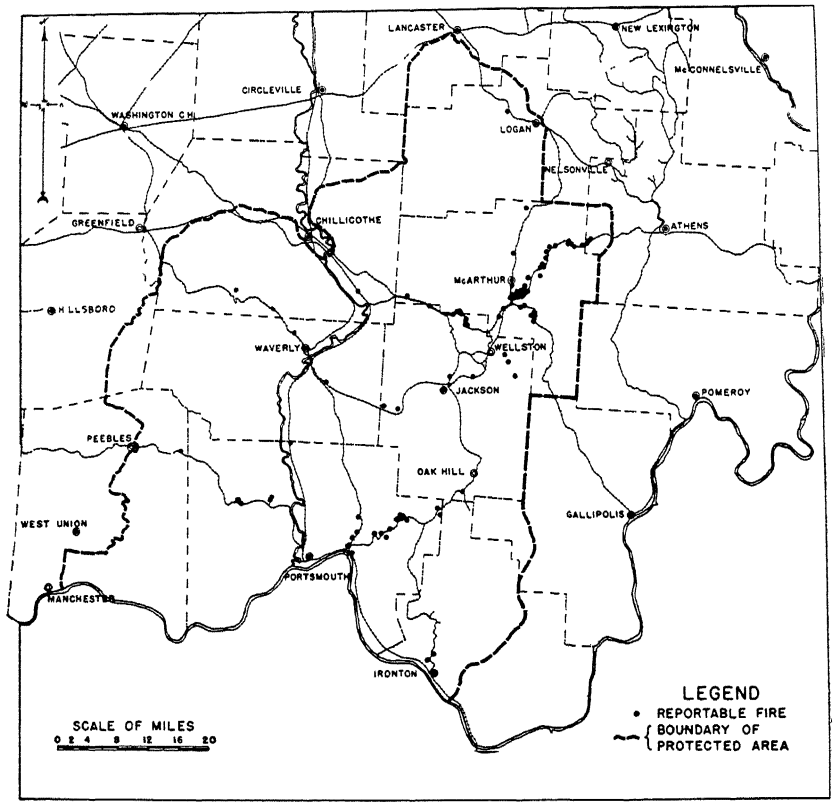

Fig. 19.—Location of all fires caused by railroads, 1931 to 1935

Spot maps of lightning and lumbering fires have not been published herewith because these causes are relatively unimportant. No spot map for fires of unknown cause is included, since action is uncertain where the cause is not known. The number of such fires will naturally diminish as the efficiency of detection and suppression increases, since the point of origin, and, therefore, the probable cause, can more readily be determined for small fires than for large ones.

CLASSIFICATION OF FIRES BY SIZE

Figure 20 shows the per cent of the total number of fires and woods area burned according to area groups or size classes for the 5-year period 1927 to 1931. Table 35 gives the data upon which this graph is based and adds further figures on damage and cost of suppression. This table contains some highly useful and significant figures. Although nearly 53 per cent of all the fires during this period fall within the two smallest size classes, these account for but 6 per cent of the total woods area burned and only 5½ per cent of the total woods damage. Figures such as these promise high returns indeed to well-laid plans for increased efficiency in detection and suppression. If only the fires exceeding 10 acres in size had been eliminated, most of the damage would have been averted. Of course it must be remembered that the prompt suppression of a given fire does not take the fire off the record but merely moves it down the scale into another and smaller size class, where it increases by a little the area and damage figures for fires of the smaller class while it detracts much more from the figures of the greater size class. With this in mind it would be approximately correct to say that if all fires over 10 acres in size had been extinguished before reaching that size, the total area burned would not have exceeded 12 per cent of the woods area actually burned during the period under consideration. To sum up the matter, it might be said that Table 35 and Figure 20 clearly show that no stone should be left unturned to bring each fire under control as quickly as possible and that no effort should be spared to keep the fire from breaking out a second time, an event which experience teaches is apt to be a most costly contingency.

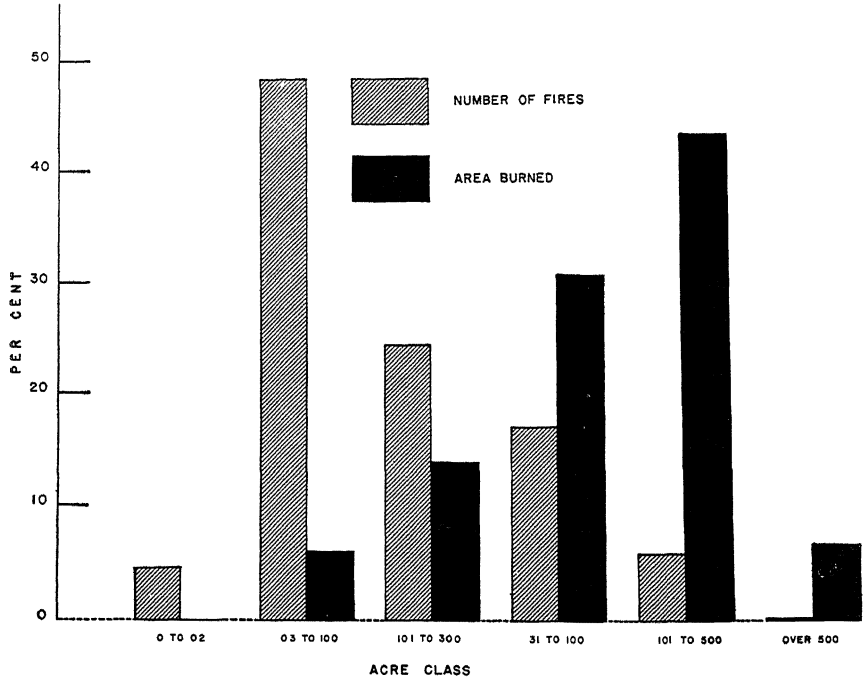

Fig. 20.—Per cent of total number of fires and area burned by acre classes, 1927 to 1931

TABLE 35.—Total Number of Fires, Woods Area Burned, and Cost of Suppression of All Fires Grouped According to Size Classes

For the 5 years 1927 to 1931

Size class, acres	Number of fires		Woods area burned			Damage to woods			Cost of suppression			
	Total	Per cent	Acres	Per cent	Acres per fire	Dollars	Per cent	Per fire	Dollars	Per cent	Per fire	Per fire
0 to 0.2	87	4.6	6.0	0	0.07	4.50	0	0.05	217.33	0.9	2.50	36.22
0.3 to 10.0	905	48.2	3,068.6	6.0	3.4	7,245.00	5.5	8.01	5,158.61	20.7	5.70	1.68
10.1 to 30.0	454	24.2	6,996.0	13.8	15.4	17,561.50	13.2	38.68	5,521.85	22.1	12.16	.79
31 to 100	317	16.9	15,488.5	30.5	48.8	44,415.00	33.4	140.11	7,293.58	29.2	23.01	.47
101 to 500	111	5.9	21,797.0	43.0	196.4	51,419.00	38.7	463.23	6,216.24	24.9	56.00	.28
Over 500	4	0.2	3,400.0	6.7	850.0	12,280.00	9.2	3,070.00	546.54	2.2	136.64	.16
Total	1,878	100.0	50,756.1	100.0	.....	132,925.00	100.0	.....	24,954.15	100.0	.....	.....
Average	375.6	.....	10,151.2	.....	27.0	26,585.00	.....	70.78	4,990.83	.....	13.29	0.49